

CHARACTERIZING CANOPY FUELS AS THEY AFFECT FIRE  
BEHAVIOR IN PITCH PINE (*PINUS RIGIDA*) P. MILL.

A Thesis Presented

By

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Submitted to the Graduate School of the  
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Forest Resources  
Department of Natural Resources Conservation

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## **DEDICATION**

To the memory of Daniel Holmes - Arrowhead Hotshots 2004. Although I did not know Dan personally, his story reminds me of the fire fighters I have worked with that demonstrate pride, safety, and teamwork. These Arrowhead principles were the foundation for my study of wildland fuels and fire. Thank you Arrowhead and may Dan's life be remembered.

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## ABSTRACT

### CHARACTERIZING CANOPY FUELS AS THEY AFFECT FIRE BEHAVIOR IN PITCH PINE (*PINUS RIGIDA*) P. MILL.

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Fire managers in the Northeast are increasingly concerned about crown fire development in pitch pine (*Pinus rigida*) P. Mill. Increased awareness of eastern crown fire problems has led to increased interest in predicting the development and behavior of crown fires in pitch pine. Models developed in the western United States exist to predict crown fire behavior. Managers in the Northeast, however, have relied on western data to predict crown fire behavior in pitch pine stands. Pitch pine-specific inputs to these models, most notably canopy bulk density (CBD), have not been available to northeastern fire managers. The objective of this study is to add pitch pine crown characteristics to the body of data on canopy fuel characteristics. Following destructive sampling of 31 pitch pine trees in Montague and on Martha's Vineyard, Massachusetts, I developed predictive equations that will enable fire managers to predict CBD in pitch pine based on the indirect variable diameter at breast height ( $r^2 > 0.93$ ). To demonstrate the application of the predictive equations, I calculated the wind speed needed to sustain an active crown fire in a treated and an untreated pitch

pine stand in Montague. The results indicate that CBD, calculated with the equations I derived, can be manipulated to reduce the threat of catastrophic crown fire.

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# CHAPTER 1

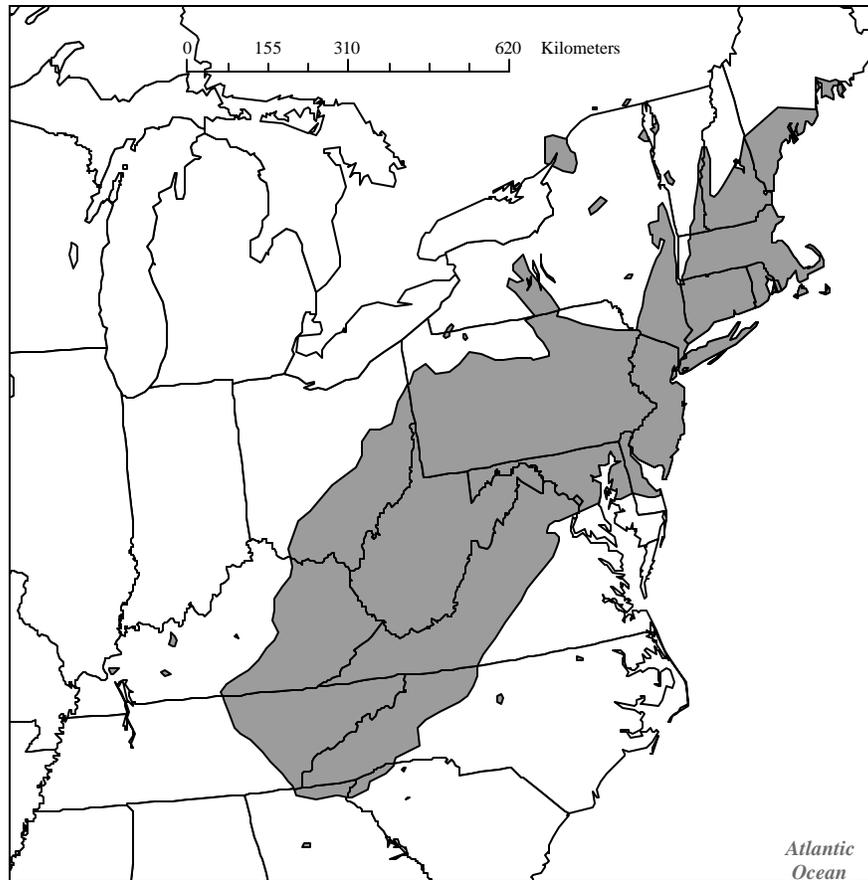
## INTRODUCTION

Surface fires spread through surface fuels, whereas crown fires burn in the canopies of trees that overlie surface fires and fuels (Finney 1998). Compared to surface fires, crown fires within the same fuel complex are associated with:

- greater difficulty of control (Scott and Reinhardt 2001),
- higher spread rates (Rothermel 1983),
- more frequent spotting occurring over longer distances (Butler and Cohen 1998),
- increased radiant heating making structures more difficult to defend (Butler and Cohen 1998),
- longer flame lengths dictating larger safety zones (Butler and Cohen 1998), and
- ecological effects that are more immediate and long lasting (Reinhardt and Crookston 2003).

Crown fires are a chief concern among forest managers in the western U.S and represent a unique problem in pitch pine (*Pinus rigida*) P. Mill. barrens of the Atlantic Coastal Plain (Figure 1). The development and behavior of crown fires are difficult to predict and often erratic. Increased awareness of eastern crown fire problems has led to increased interest in predicting the development and behavior of crown fires.

Figure 1. Pitch pine range in the Northeast (adapted from Little and Garrett 1990).



Models exist to assist fire managers in predicting intensity and rate of spread of crown fires in homogeneous stands of many coniferous tree species. Van Wagner (1977) theorized and Rothermel (1991) applied the concept that the minimum spread rate of a crown fire is a function of the density of a crown fuel layer. Canopy characteristics, which are inputs to crown fire models, have never been measured directly for pitch pine. In the West, Brown (1978), Snell and Brown (1980) and others have developed predictive equations that relate crown characteristics to easy-to-measure inventory data such as diameter at breast height (dbh).

The objective of this study is to add pitch pine crown characteristics to the body of data on canopy fuels. Specifically, I address the following questions: Knowing that canopy weight is an input to current crown fire models, can equations developed to estimate crown characteristics of other conifer species be used to accurately predict pitch pine canopy characteristics? If not, can regression equations be constructed to accurately predict pitch pine crown weight based on sampled pitch pine trees?

### **The Crown Fire Problem**

The very real threat of and destruction caused by fires burning through the crowns of wildland fuels (i.e. crown fires) has been a prominent feature of news stories emanating from the western U.S. in recent summers. The eastern United States has such a fire problem, although it is not as widely recognized. Referring to the 1963 fires in the pitch pine dominated New Jersey Pine Barrens, Larry Teitelbaum writes: “Scores of fires roared through the pinelands with the effect of napalm bombs, destroying \$8.5 million worth of property in a three-day campaign” (Teitelbaum 1986). Seventy seven thousand five hundred hectares (186,000 acres) burned that April weekend; seven people were killed; and 186 houses were damaged or destroyed. Southeastern Massachusetts barrens have a similar long history of catastrophic wild fires (Winston 1994). The 1957 Plymouth fire is said to have produced flame lengths that towered 45 meters (150 feet) in the air with rates of consumption averaging 7.5 hectares/minute (18 acres/min) (W.A. Patterson III, personal communication).

Due to the hazard associated with crown fires, their behavior cannot be evaluated directly using prescribed burns. In this study, I estimate crown fire potential in pitch pine

using crown fuel characteristics estimated from tree bole characteristics. As an example of the application of my results, I evaluate the effectiveness of crown fire hazard fuel mitigation treatments for a pitch pine cover stand at the Montague Plains Wildlife Management Area (MPWMA) in west-central Massachusetts. The objective of the fuel treatment is to reduce the hazard of crown fire. By extrapolating plot crown fuel characteristics to a stand basis, I demonstrate the use of canopy bulk density inputs to assess the potential crown fire behavior in a treated and untreated stand. Validating the model is not part of this study.

### **Types of Crown Fires**

All crown fires do not behave the same way. The expected flame lengths and rates of spread for a crown fire vary depending partly on the type of crown fire. Fire managers often predict the type of crown fire expected in a given fire environment and therefore understand something about the expected fire behavior. Van Wagner (1977) identified and Scott and Reinhardt (2001) defined three types of crown fires:

- A passive crown fire is one in which individual or small groups of trees ignite, but sustained crown-to-crown flaming cannot be maintained except for short periods. Passive crown fires encompass a wide range of crown fire behavior from the occasional torching of an isolated tree to nearly active crown fire behavior (Figure 2a).
- In an active crown fire the entire fuel complex becomes involved, but the crowning phase remains dependent on heat released from the surface fuels for continued

horizontal spread through the canopy. Active crown fires are also called running or continuous crown fires (Figure 2b).

- An independent crown fire is one that spreads without the aid of a supporting surface fire. These fires are very rare. They are usually possible only on steep slopes or when accompanied by very high winds.

Figure 2. Passive or torching crown fire (2a) and active crown fire (2b) differ in intensity.

2a)



2b)



### **Predicting Fire Behavior**

Fire scientists have prioritized fuel and silvicultural treatments to minimize the threat of crown fire development (Scott and Reinhardt 2001). To assess crown fire hazard and to project active fire spread, fire managers use models to predict the potential of a projected fire for given topographic, fuel, and weather parameters. A fire model is defined as a mathematical projection of a fire behavior system that accounts for its known or inferred properties and may be used for further study of its characteristics (Finney

1998). Fire modeling techniques have been developed to evaluate accurate fuel treatment prescriptions to reduce the risk of crown fire and to directly predict crown fire behavior.

Several types of fire models exist. The National Fire Danger Rating System (NFDRS) was developed to guide short-range planning for wild fire occurrence and behavior (Deeming et al. 1978). The NFDRS does not predict how individual fires will behave, but rather describes the near upper limit of the behavior of fires that might occur on a rating area during the rating period. It does not address crowning and spotting. Experience with the NFDRS enables users to identify critical levels of fire danger when such behavior is highly probable (Deeming et al. 1978). Models initially emphasized western fuel beds. Recognizing a need for better fuel modeling techniques in the East, Burgan (1988) revised the 1978 version of the National Fire Danger Rating System to better meet that need. Research is currently underway to further modify existing NFDRS fuel models to better predict fire danger in eastern barrens (Hom 2002).

BEHAVE is used to predict the behavior of individual fires (Andrews 1986). It is used for site-specific, real-time fire behavior predictions where estimates of actual fire behavior are needed. The model describes fire spreading through surface fuels although it can also identify when surface fire conditions become severe enough to expect crowning and spotting. Rothermel (1983) describes the conditions for which crown fires are likely to occur as those that will produce fire-line intensities in surface fuels beginning in the 413-827 kilocalorie/m/s (500 to 1000 Btu/ft/s) range.

Scott and Reinhardt (2001) linked surface fire behavior models based on BEHAVE calculations with Van Wagner's (1977) crown fire model using NEXUS-a Microsoft Excel-based program which, through a system of fire behavior models,

evaluates the potential and behavior of crown fires (Scott 1999). Van Wagner's (1977) approach to fire behavior, with supplemental expert opinion, has proven to be a useful tool to predict the spread and intensity of crown fire during wildfires and prescribed fires and to investigate relative fire hazards associated with different fuel or silvicultural treatments (Alexander 1988). Van Wagner's model involves knowledge of canopy base height and canopy bulk density.

Canopy base height (CBH) is defined as the lowest height above the ground at which there is enough canopy fuel to propagate fire vertically into the canopy. It incorporates the presence of "ladder" fuels (Alexander 1988; Forestry Canada Fire Danger Group 1992; Van Wagner 1993), i.e. dead branches or small trees connecting the surface fire to the crown fuels that would effectively lower the nominal value of the CBH. Van Wagner's model assumes that the threshold for transition to crown fire is dependent on the crown foliar moisture content and the height to the base of the crown (Van Wagner 1989).

Canopy bulk density (CBD) is the mass of canopy fuel per unit canopy volume. Canopy volume (CV) is the area of the stand multiplied by canopy depth, which is the crown base height subtracted from the canopy height. CBD is a property of stands, not individual trees (Scott and Reinhardt 2001).

Canopy bulk density is largely based on the weight of foliage, because crown fires consume almost exclusively foliage. The bulk of the branchwood that connects the foliage to the main bole contributes little to crown fire intensity. Following Scott and Reinhardt (2001) and Call and Albini (1996), I define the available canopy fuel (ACF) as

all of the foliage and ½ of the 0-0.6 cm (0-0.25 inch) diameter branchwood. The ACF is the fuel component that will contribute to the active spread of a crown fire.

Post-frontal combustion is the combustion of fuel after the fire front has passed. With lower bulk densities in canopy fuels, more convective cooling takes place resulting in little-to-no post-frontal combustion (J. Scott, personal communication). This is why only the smallest fuel components are used in the fire behavior prediction models.

The type of crown fire (passive, active, or independent) depends on the threshold for active crown fire spread rate which is estimated using the Crowning Index (CI) (Alexander 1988, Scott and Reinhardt 2001). The CI is the open, 6-meter (20 ft) above the canopy wind speed at which active crown fire is possible for a given fire environment (Scott and Reinhardt 2001). CI inputs are CBD, percent slope, and the surface fuel moisture content (Scott and Reinhardt 2001).

Van Wagner (1977) hypothesized that the canopy bulk density of the crown fuel layer must have a lower limit below which active crowning cannot be maintained. He showed that active crowning would occur when a critical horizontal mass-flow rate of fuel into the flaming zone was exceeded. Using a test fire in a red pine plantation, Van Wagner determined a critical mass flow rate of  $0.05 \text{ kg/m}^2/\text{sec}$  by multiplying the CBD (in  $\text{kg/m}^3$ ) with the after-crowning, forward rate of spread ( $R_o$ ) in meters/sec. With limited research on critical mass flow rate from a wide range of forest types, fire managers throughout the country use Van Wagner's red pine critical mass flow rate (Scott and Reinhardt 2001). Alexander (1988) and Scott and Reinhardt (2001) rearranged Van Wagner's equation to solve for ( $R_o$ ). By substituting 0.05 for the critical mass flow rate, and multiplying by 60 to compute spread rate in meters/minute, equation

(1) shows that CBD is the only factor affecting the critical spread rate needed to sustain an active crown fire.

$$R_o \text{ (m/min)} = 3.0 / \text{CBD (Kg/m}^3\text{)} \quad \text{Equation (1)}$$

Canopy bulk density characteristics are difficult to sample directly, so fire scientists are evaluating various methods of indirect characterization for accuracy. These include remotely sensed light measurements as well as fuel photo guides (Scott and Reinhardt 2001, Keane et al. in prep, Andersen et al. in prep). Pending current research, using regression equations based on indirect inventory sampling has proven to be the most effective method of estimating crown fuel characteristics (Scott and Reinhardt 2001).

### **Previous Work**

Several species-specific studies predict foliar and branch biomass from tree dimensions. These studies encompass regression models, which typically use diameter and other indirect measures as independent variables (Scott and Reinhardt 2001). Brown (1978) provides predictive equations for eleven conifer species in the Inland West. Snell and Brown (1980) provide similar algorithms for Pacific Northwest conifers. Reinhardt et al. (in press) provide updated equations for some of Brown's original species.

Whittaker and Woodwell (1968) studied the distribution of biomass within individual pitch pine trees. They undertook dimensional analysis as a first phase of

research on biomass, production, and nutrient circulation in a long-term study of various aspects of the ecological characteristics of the Brookhaven Forest on Long Island, New York. Fifteen pitch pine stems were destructively harvested and branches subsampled for detailed measurements. The average diameter at breast height for the 15 trees was 15.2 cm (6 in), with a range of 2.5 cm to 30.5 cm (1 in to 12 in). They sampled only the smaller stems within the range of pitch pine that have crown fire potential. They separated branches not by stem size class but by “current twigs with current year leaves” in one class and “last year’s foliage” in another. They separated 1<sup>st</sup> and 2<sup>nd</sup> year needles and twigs at the new year’s bud scar. These data might have been useful in characterizing fuel components for crown fires, but Whittaker and Woodwell (1968) do not present data for the 15 individual stems. Freeman et al. (1982) used some of Whittaker and Woodwell’s biomass data, although for only 12 trees. Had I obtained the raw data from Whittaker and Woodwell, I could have included the Brookhaven pitch pine crown weights in my model. Failed attempts to obtain the data have limited their usefulness to me.

Aside from the Brookhaven work, I know of no other studies characterizing pitch pine crowns. Fire behavior modelers have thus been forced to substitute western species crown characteristics when modeling crown fire behavior in pitch pine (Mouw 2002). Lodgepole pine (*Pinus contorta*), ponderosa pine (*P. ponderosa*) and white bark pine (*P. albicaulis*), all have crown characteristics similar to pitch pine (personal observation).

## CHAPTER 2

### METHODS

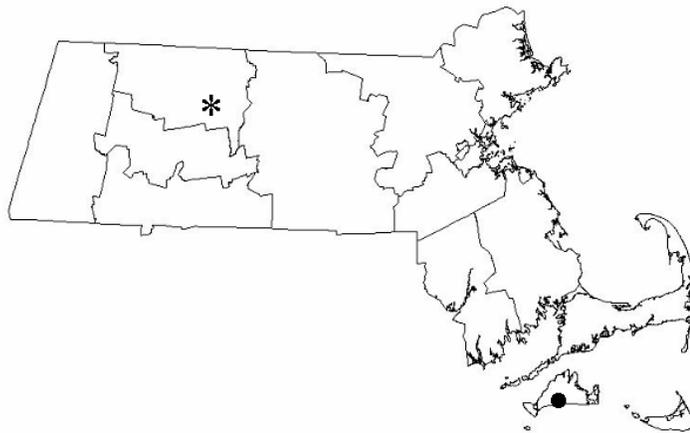
#### Site Selection

I selected study sites that contain pitch pine of a size and stocking that are prone to crown fire. These sites in Montague and Martha's Vineyard, Massachusetts have crown fuels that represent possible worst-case scenarios for crown fire in pitch pine in New England. They do not include the full range of pitch pine crown conditions possible, but instead serve as examples of particularly dense stands. As such, they provide a foundation for additional crown fuel sampling. Aside from torching potential, understocked, open-grown stands do not have the same level of crown fire hazard as dense, closed-canopy stands. I evaluated the extent to which my plots are representative of wider conditions by comparing the canopy cover, stem density, and basal area of stands I sampled to other pitch pine stands.

I chose three, 0.03-hectare (0.08 acre) fixed-radius plots representing the stand conditions described above. Two were located in the Montague Plains Wildlife Management Area in west-central Massachusetts, and one was in the Manuel F. Correllus State Forest on Martha's Vineyard (Figure 3). I chose the first Montague plot as an example of a dense, young stand with many suppressed and intermediate crowns. The second Montague plot has larger pitch pine trees with many co-dominant and dominant stems. Both plots are on excessively drained, Hinckley sandy loam soils developed in stratified, coarse-textured glaciofluvial deposits of sand, gravel, and cobbles located in homogeneous flat topography (Mott and Fuller 1967). Trees on the Martha's Vineyard

plot are intermediate in density and size-class distribution compared to the dense, small trees of the first Montague plot and the more open grown, large trees of the second Montague plot. The soils are Carver loamy sand's, very deep, excessively drained on a glacial outwash plain located in gently rolling topography (Fletcher and Roffinoli 1982).

Figure 3. Location of study sites in Montague (\*) and Martha's Vineyard (●), Massachusetts.



### **Data Collection**

#### **Sample Tree Selection**

After measuring diameters of all the trees in each plot, I randomly chose one tree from each 2.5 cm (1-inch) size class to sample. By selecting trees from a range of diameters in each stand, I hoped to capture the range of variability in crown characteristics within the population. I excluded sample trees if they were open grown, of extremely irregular crown shape, deformed excessively by disease, heavily defoliated, or had broken tops.

### Individual Tree Characteristics

I sampled several characteristics unique to individual sample trees in order to indirectly predict crown weight. These included diameter at breast height (dbh) to the nearest 0.1 cm, and tree height and crown base height to the nearest 0.3 m using a clinometer. I aged each tree by counting the rings of an extracted core or disk and recorded the crown dominance as suppressed, intermediate, codominant or dominant (Richard 1952, and Oliver 1978).

I destructively harvested canopy fuel from each tree between June 30th and August 20<sup>th</sup>, 2003 using methods described by Reinhardt et al. (in press). Small trees were rigged, felled, and limbed. Larger trees were climbed, limbed, and topped (Figure 4). All branches were cut flush with the bole and tree biomass was separated into one-meter height increments.

Figure 4. Climbing and limbing large trees at Montague



My sampling included inventories of both large and small branches. I sampled several easy-to-measure characteristics on each branch for later use as independent variables in the development of allometric equations to predict canopy fuel. I weighed each live large branch  $> 0.6$  cm (0.25 in) basal diameter and recorded the height above the ground from which it came. I also cut and weighed all dead and small live branches  $< 0.6$  cm (0.25 in) basal diameter within each 1-meter height increment. For large live branches, four parameters were sampled in the field: field weight to the nearest 10 grams using a hanging scale mounted on a bipod, branch length to the nearest 0.1 m using a logger's tape, basal diameter beyond the butt swell to the nearest 0.1 cm using digital calipers, and foliage ratio defined as the percent of live foliage observed on the branch to the total amount of foliage the branch could support ( $\pm 10\%$ ).

### **Subsample Branch Characteristics**

Following guidelines by J. Scott, (personal communication), I systematically choose 8% of the large live branches to use as subsample branches and directly measured the available canopy fuel (ACF) load in those branches by separating, drying, and weighing each component. Because I expected different moisture contents from different fuel components, I separated current year, past year, and dead needles; live and dead branches; and live and dead cones. In the field I separated needles from branches and separated branches by diameter class [ $<$  or  $> 0.6$  cm (0.25 in)] using calipers. I recorded the wet weight of sorted components separately and determined dry weights from grab samples of the sorted material after drying at 70 degrees C for 48 hours.

Because field sampling began before the new, current-year's needles had fully developed, I adjusted the weight of the new foliage using the ratio of new and old needle length (see Appendix A). The lengths of 50 of each current-, and past-year's needles were recorded for each sample day to correct for the progressive development of the current-year's needles throughout the field season.

To estimate dry weight of the small live and dead branches from each 1-meter height increment, I choose a random sample of each. These were separated and weighed as with the large branches.

### **Individual Stand Characteristics**

At each plot several stand-level characteristics were sampled. Canopy cover (%) was estimated with a spherical densiometer at 25 locations per plot. At each of five points within the plot five observations were recorded (plot center, and 3 meters (9.8 ft) from plot center in each of four cardinal directions). Basal area was sampled using an angle gauge<sup>00</sup> (BAF=10ft<sup>2</sup>/acre) with plot center at each sample tree. This provided a separate "surrounding stand basal area" for each sample tree. I also measured the diameters of the "in" trees in order to calculate a separate stand density for each tree.

### **Analysis**

I used multiple linear regression in a two-step process to predict the available canopy fuel (ACF) of my sample trees. First, I developed a set of equations that would predict the ACF of all the large live branches. Next, I developed a regression model that, using the results of the first regression and the addition of the dead and small live

branches, predicted the ACF of the entire tree. All regression analyses were performed using SAS statistical software (SAS Institute, 1999).

## CHAPTER 3

### RESULTS

#### Stand Characteristics

The three plots I chose are examples of dense stands of pitch pine that are prone to crown fire. Stand basal areas ranged from 33.1 to 43.2 square meters per hectare (144 to 188 square feet per acre) and densities from 670 to 1782 trees per hectare (271 to 721 trees per acre) (Table 1). Canopy cover ranged from 84 to 92 percent. The age and height values represent the average of the codominant and dominant trees that I sampled.

Table 1. Stand characteristics of the individual sample plots

site - plot #	basal area m <sup>2</sup> /ha	density of trees #/ha	canopy cover %	stand height m	age years
Montague #1	33.1	1781.6	92	14.5	36
Montague #2	39.5	669.7	84	21.9	69
Martha's Vineyard #3	43.2	1364.0	87	14.3	55

#### Individual Tree Characteristics

The raw field and lab data are presented in the appendices. Metrics for the 31 sample trees are summarized in Table 2. Crown class defined as dominant, codominant, intermediate, or suppressed is abbreviated to d, c, i, and s respectively. Crown weight includes the entire tree biomass minus the bole. The < 0.6 cm (0.25 in) top of the bole was considered a branch and was thus included. Foliage weight includes all of the live and dead foliage, and the < 0.6 cm (.25 in) branch weight includes all of the live and dead branchwood < 0.6 cm (0.25 in).

Table 2. Individual sample tree characteristics by sample plot

Site - plot #	tree	dbh	height	crown base height	age	crown class	crown weight	foliage	branch < .25"
		cm	m	m	years		kg	kg	kg
Montague #1	1	20	14.8	9.3	37	d	19.4	6.5	4.5
	2	22.7	13.4	8.1	35	c	32.0	6.2	4.1
	3	5.5	7.6	5.0	22	s	0.8	0.3	0.2
	4	7.5	11.8	7.6	32	i	1.5	1.0	0.2
	5	18.6	14.6	9.6	33	c	13.6	3.4	2.4
	6	18	14.1	8.0	31	c	16.9	4.4	3.3
	7	12.2	13.9	8.6	26	i	3.6	1.6	0.6
	8	24.9	15.8	7.0	42	c	29.7	11.7	5.8
	9	2.7	4.1	1.7	20	s	0.3	0.1	0.1
	10	9	9.1	2.2	27	s	1.2	0.6	0.4
	11	16.1	13.0	7.8	35	i	14.7	5.5	2.8
Montague #2	12	42.5	23.1	9.0	67	d	117.0	35.1	21.4
	13	38.5	21.1	13.0	70	d	77.1	24.2	15.0
	14	39.9	23.8	13.5	70	c	112.3	37.6	23.8
	15	29.4	21.7	11.4	69	c	44.7	16.1	8.5
	16	28.2	20.7	20.7	69	c	36.2	10.9	6.9
	17	13.1	14.4	4.0	42	s	3.9	1.0	0.9
	18	24.5	21.9	12.6	55	c	24.2	9.5	4.6
	19	16.3	11.2	7.7	51	s	5.2	1.8	0.9
	20	18.7	15.8	4.3	57	s	8.6	3.2	2.4
	21	23.2	20.6	14.3	69	i	17.5	8.0	3.7
	22	33.4	21.4	12.2	81	c	72.0	20.1	13.9
	23	20.7	17.2	13.8	55	i	9.2	2.8	1.9
Martha's Vineyard #3	24	27.1	11.3	5.2	55	c	56.0	15.4	10.4
	25	15.5	12.7	9.4	46	i	15.0	3.2	2.3
	26	20.8	12.8	8.0	50	c	25.4	6.2	4.9
	27	17.4	12.5	7.0	49	i	17.2	4.5	2.9
	28	23.7	16.0	10.6	61	d	47.9	11.1	8.0
	29	31.6	16.8	9.0	55	d	97.1	24.2	18.6
	30	11.6	9.9	7.7	38	s	4.9	0.9	0.7
	31	26	14.4	8.6	56	c	58.0	16.8	9.7

**Wet Weight To Dry Weight Adjustment**

The wet weight of a given branch component varies diurnally and seasonally.

Therefore, for each crown component of the samples, I adjusted the wet crown weights to an oven-dry basis using moisture contents. Because daily wet weight varies and dry

weight is constant, I corrected the wet weights of the individual components using the component dry-weight: wet-weight ratio averaging the daily dry weight: wet weight ratios by plot (equation 2).

$$D = W * (n_j / q_j) \quad \text{Equation (2)}$$

Where, for plot  $j$ :

$D$  = dry weight (g) of the branch component

$W$  = wet weight (g) of the branch component

$n_j$  = dry weight (g) of the moisture sample component (average per plot)

$q_j$  = wet weight (g) of the moisture sample component (average per plot)

To account for incomplete needle elongation prior to sampling, I adjusted the weights of current-year needles (Equation 3). For each sample day ( $k$ ), I determined the relationship between average weight and length of 50 needles. I corrected the dry weight of the current year needles ( $U_k$ ) using the ratio of current-year needle length to previous-year needle length. This correction is based on the fact that the underdeveloped needles sampled in the early summer eventually develop a length and corresponding dry weight similar to the one-year-old needles (Appendix A).

$$A_k = U_k * (P_k / C_k) \quad (\text{equation 3})$$

Where, for sample day  $k$ :

$A_k$  = adjusted weight of current-year needles

$U_k$  = unadjusted weight of current-year needles

$P_k$  = average length of 50, 2002 needles for each sample day

$C_k$  = average length of 50, 2003 needles for each sample day

### **Predictive Equations**

#### **Large Live Branch Weight**

After calculating the dry weights of the subsample branches, I used multiple linear regression analysis to fit equations to my subsample branch data to predict the dry weights of the remaining non-subsample branches. I used the log transformed variables wet weight, basal diameter, length, and foliage ratio. This process identified independent variables with p-values less than 0.05 using a forward selection modeling procedure and allowed me to choose the best model. I examined residual plots and verified the model assumptions of normality, homogeneity of variance, and dependent variable independence (Quinn and Keough 2002). I fit separate regression equations to three separate log transformed dependent weight variables: total branch, foliage, and branch wood < 0.6 cm (0.25 in) (Table 3). Using these regression equations, I predicted the dry biomass of total branch, foliage, and branchwood less than 0.6 cm (0.25 in) for every large, live branch from each sample tree.

Table 3. Large branch regression equations by branch component

Branch component (g)	Large Branch Regression Equation	R <sup>2</sup>
LN(total branch weight)	$= -0.46764 + 0.88688\ln(W_i) + 0.16917(F_i)$	0.9931
LN(foliage weight)	$= -1.68682 + 0.77557\ln(W_i) + 1.81576(F_i)$	0.9547
LN(< 0.6 cm branchwood weight)	$= -0.056633 + 0.87541\ln(W_i) - 1.66853(F_i)$	0.8744

Where:  $\ln(W_i)$  = natural log of wet branch weight (g), and  $(F_i)$  = foliage ratio

### Dead and Small Live Branch Weight

To calculate the component dry weight for dead branches (equation 4), I completed the following procedures: For each tree ( $i$ ), I summed the total wet weight of all of the dead branches ( $C_i$ ). Next, I multiplied  $C_i$  by the wet weight component ratio ( $E_i / F_i$ ). This ratio is the fraction of the total wet weight that is represented by the size class components (less than or greater than 0.6 cm) of that tree. Finally, I multiplied this weight by the dry weight ratio for each sample plot ( $j$ ) from equation 2 ( $n_j/q_j$ ) resulting in the dry weight of the dead branches by size class component for each tree.

To calculate the component dry weight for small live branches, I used equation 4 and substituted small live branches for dead branches. In addition to separating the live and dead branchwood (< or > 0.6 cm), I also divided the dead, 2002 and 2003 needles.

$$B_i = C_i (E_i / F_i) (n_j / q_j) \quad \text{equation (4)}$$

Where, for tree “*i*” in plot “*j*”:

$B_i$  = dry weight of dead branches by component for each sample tree (*i*)

$C_i$  = total wet dead branch weight for each sample tree

$E_i$  = component weight of sub sample

$F_i$  = total weight of sub sample

$n_j/q_j$  = dry weight to wet weight ratio of each component (from equation 2)

### **Correlating Crown Weight With Tree Characteristics**

Using the equations from Table 2 for large live branch weight and equation (4) for dead and small live branch weight, I estimated the total crown weight (minus the bole) of each sample tree. Next, I developed regression equations to predict the dry weight of 1) the canopy minus the bole, and separately, 2) needle, and 3) branchwood less than 0.6 cm (0.25 in). I used the log transformed variables dbh, height, surrounding stand basal area, surrounding stand density, canopy cover, age, crown base height, and indicator variables for forked top and tree dominance as independent variables to estimate the weight of these three crown components.

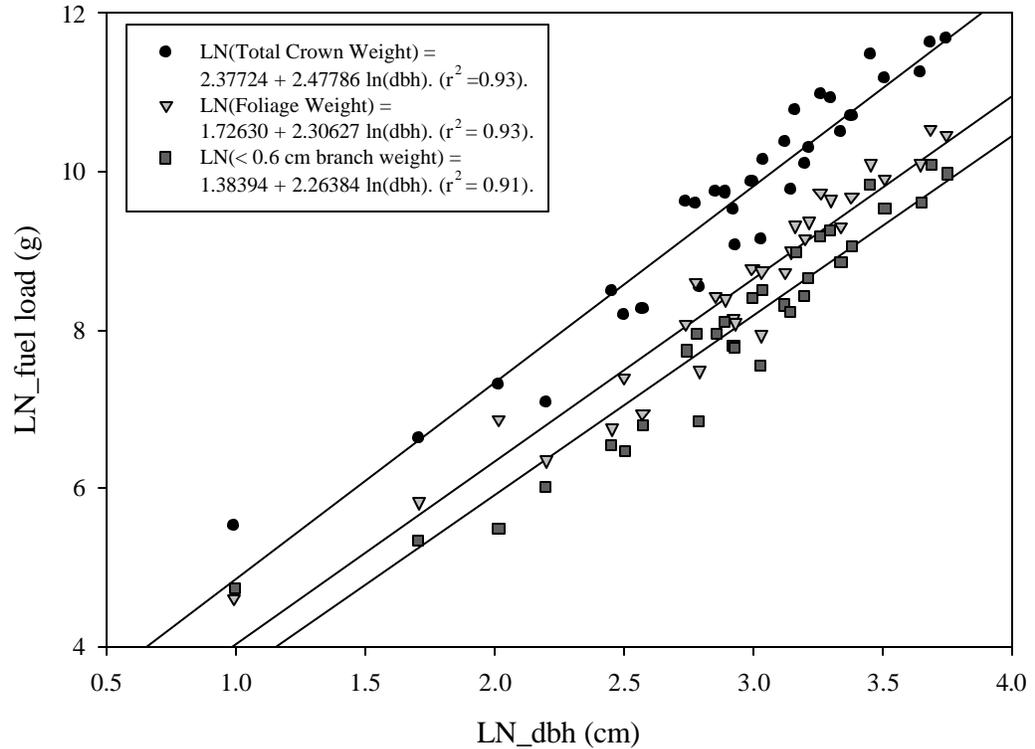
The model allowed me to chose significant independent variables with p-values < 0.05 using a forward selection model procedure (Table 4). The coefficients of determination ( $r^2$ ) for the simplest models are nearly as high as for the more complicated ones. This process demonstrated that there was little to gain by adding multiple variables. Thus, for prediction purposes, I focused on the simplest models (Figure 5).

After a model was chosen, I examined residual plots to verify the model assumptions of normality, homogeneity of variance, and dependent variable independence (Quinn and Keough 2002). Of the models that I chose, all met these assumptions.

Table 4. Coefficients of determination ( $r^2/R^2$ ) and significance (p) for regression models. Models were selected with p-values < 0.05.

<b>Total weight</b>	<b><math>r^2/R^2</math></b>	<b>P</b>
LN(dbh)	0.93	<0.0001
LN(dbh), intermediate, suppressed	0.96	<0.0001, 0.118, 0.0005
LN(dbh), LN(height)	0.95	<0.0001, 0.0061
<b>Foliage</b>	<b><math>r^2/R^2</math></b>	<b>P</b>
LN(dbh)	0.93	<0.0001
LN(dbh), intermediate, suppressed	0.96	<0.0001, 0.0463, 0.0001
LN(dbh), LN(height)	0.93	>0.05
<b>Branch</b>	<b><math>r^2/R^2</math></b>	<b>P</b>
LN(dbh)	0.91	<0.0001
LN(dbh), intermediate, suppressed	0.94	<0.0001, <0.0001, 0.0040
LN(dbh), LN(height)	0.93	<0.0001, 0.0111

Figure 5. Pitch pine scatter plot and regression equations for total weight, foliage weight, and weight of branches < 0.6 cm (0.25 in) based on diameter at breast height (dbh).



My analysis yields predictive equations for pitch pine crown components based on indirect tree measurements (Table 5). The dependent variables for the three equations are total crown weight (excluding the bole), live and dead foliage weight, and weight of branchwood less than 0.6 cm (0.25 in). The simple models using dbh alone have high coefficients of variation ( $r^2 > 0.91$ ). In addition to dbh, the intermediate and suppressed indicator variables are significant in the forward selection model with p-values < 0.05. By adding these variables, I improved the fit (Table 6).

Table 5. Regression equations using dbh as the only response variable to predict the crown component weights of individual trees. The predicted biomass is in grams and dbh (d) is in cm.

Dependent biomass variable (g)	Regression equation	$r^2$
LN(total crown weight)	$= 2.37724 + 2.47786 \ln(d)$	0.9318
LN(foliage weight)	$= 1.72630 + 2.30627 \ln(d)$	0.9313
LN(< 0.6 cm branchwood weight)	$= 1.38394 + 2.26384 \ln(d)$	0.9147

Table 6. Regression equations using the significant tree dominance indicator variables as well as dbh to predict the crown component weights of individual trees. The indicator variables (s, and i) equal one when the tree is suppressed (s), or intermediate (i) and 0 otherwise. The predicted biomass is in grams and dbh (d) is in cm.

Dependent biomass variable (g)	Regression equation	$R^2$
LN(total crown weight)	$= 4.01369 + 2.0278 \ln(d) - 0.86824(s) - 0.46453(i)$	0.9573
LN(foliage weight)	$= 3.28041 + 1.86662 \ln(d) - 0.32274(s) - 0.87087(i)$	0.9602
LN(< 0.6 cm branchwood weight)	$= 2.89243 + 1.85035 \ln(d) - 0.73515(s) - 0.59493(i)$	0.9428

### **Western Species Equations to Predict Pitch Pine Crown Characteristics**

I evaluated how well equations for three western species predict observed pitch pine foliage weight compared to my pitch pine equations. I chose ponderosa pine, lodgepole pine and white bark pine, because I knew that these species had crown characteristics similar to pitch pine. Because I had directly sampled only 31 trees that were all incorporated in my original models, I could not fairly use these equations to compare observed versus predicted values for the same 31 trees with equations for western species. To predict tree crown weight independent of the model trees, I randomly selected eight stems from the 31 original pitch pines, removed them from the

predictive equations, and used them for the comparison. Once the comparisons were completed, I returned the eight sample trees to the regression models (Tables 5 and 6).

To evaluate how well the equations for the four species predict the observed biomass, I calculated the variance ( $MS_{Residual}$ ) using equation 5. I used  $MS_{Residual}$  to show the squared distance between the observed values and the predicted values for individual species equations (Table 6). The lower the  $MS_{Residual}$  value, the closer the predicted values are to the observed values.  $MS_{Residual}$  as a measure of variability does not depend on sample size, because it is an average of the squared deviations (Quinn and Keough 2002).

$$MS_{Residual} = \left( \sum_{i=1}^n (O_i - P_i)^2 \right) / n - 2 \quad \text{equation (5)}$$

Where,

$MS_{Residual}$  = Mean square residual for each species equation

$O_i$  = Observed value for each (i) of n trees

$P_i$  = Predicted value

n = number of trees (8)

Table 7.  $MS_{Residual}$  for four species equations for foliage weight. The pitch pine equation has the lowest  $MS_{Residual}$ .

Species	Source	$MS_{Residual}$
pitch pine	Duveneck (this study)	56.93
white bark pine	Brown (1978)	87.00
ponderosa pine	Reinhardt et al. (inpress)	99.47
lodgepole pine	Reinhardt et al. (inpress)	164.09

Figures 6 and 7 show how well the western species equations predict total crown weight (not including the bole) and foliage for pitch pine. The diagonal line represents the ideal circumstance (slope = 1) where predicted values equal observed values. Values above the line indicate overprediction of weight; values below the diagonal line represent underprediction of weight.

Figure 6. Observed vs. predicted total crown weight for pitch pine, ponderosa pine, lodgepole pine, and white bark pine.

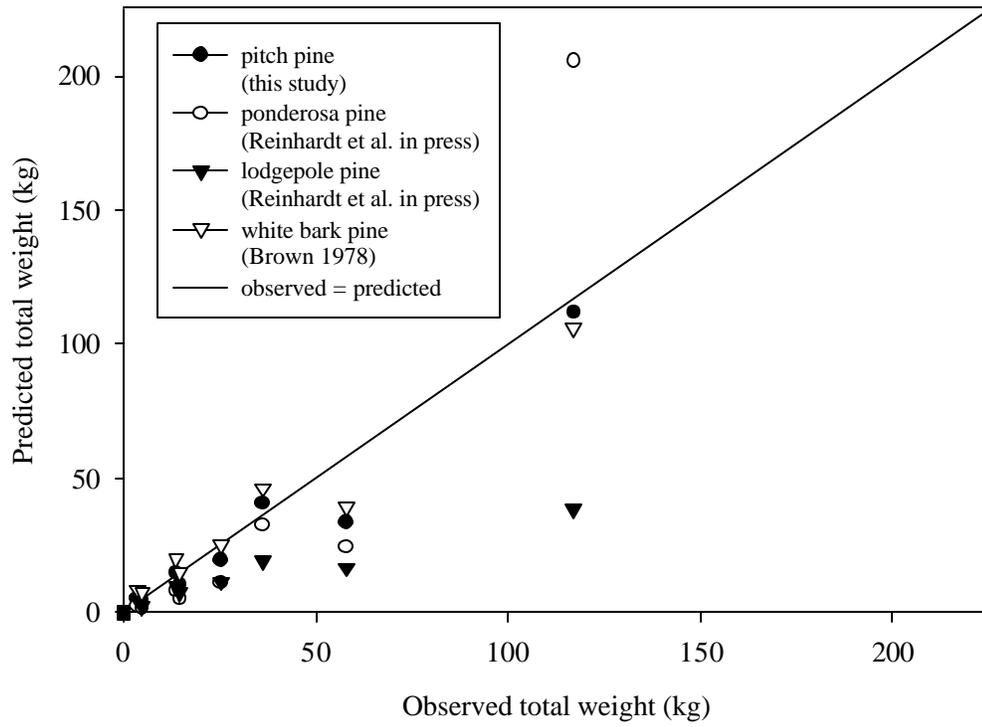
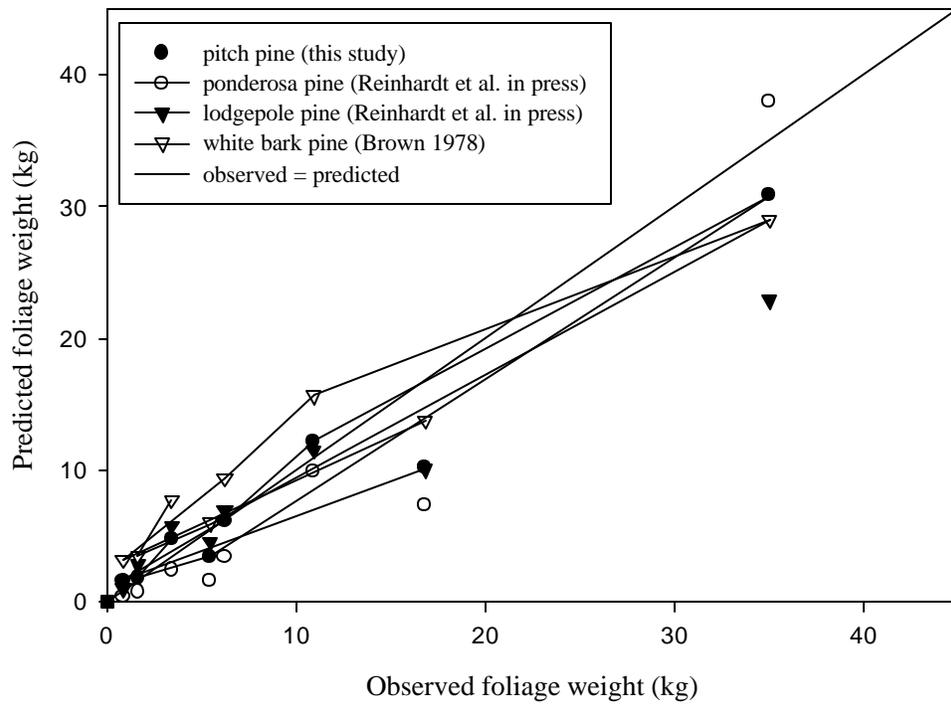


Figure 7. Observed vs. predicted foliage weight for pitch pine, ponderosa pine, lodgepole pine, and white bark pine.



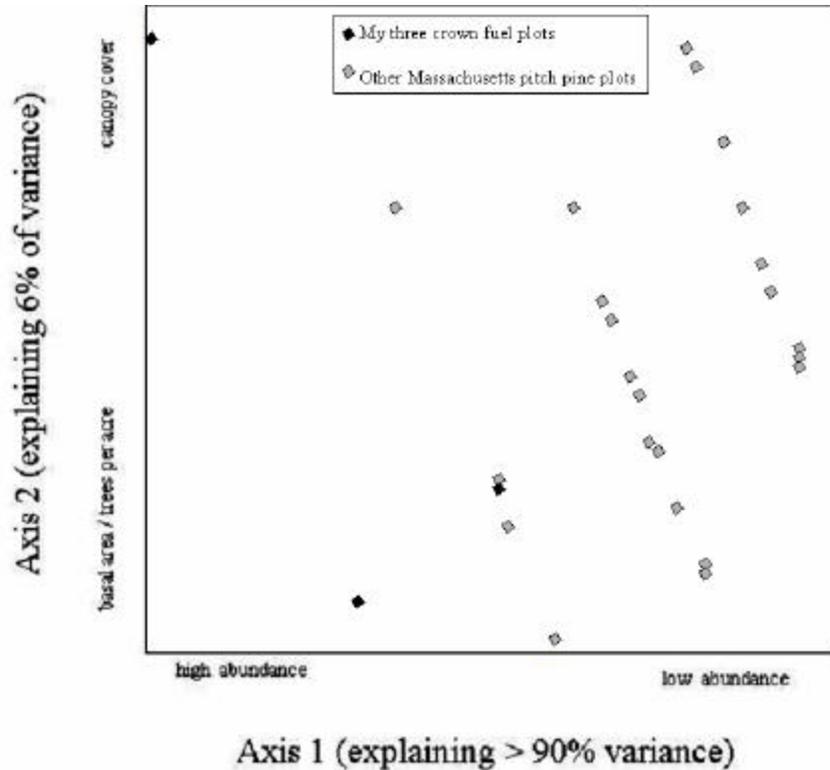
## CHAPTER 4

### DISCUSSION

#### Comparison of Pitch Pine Stands Using an Analysis of Abundance

Structurally, the stands that I sampled may have had higher pitch pine abundance as determined by canopy cover, stand density, and basal area, than most stands in Massachusetts. I used principal components analysis (PCA) to compare these stands to several other Massachusetts pitch pine stands using the three stand attributes. Axis one (Figure 8) explains >90% of the variation among plots, with high levels of canopy cover, stand density and stand basal area on the left and low levels on the right. Axis two only explains 6% of the variation. The three stands that I sampled have very high pitch pine cover, density, and/or basal area and represent extreme crown fire potential.

Figure 8. PCA ordination of my plots and several others as they relate to different measures of pitch pine abundance. Abundance measurements included in the ordination are canopy cover, stand density, and stand basal area.



### Western Species Equations

Equations for ponderosa pine, lodgepole pine, and white bark pine predict pitch pine crown weight with a large amount of variability. All predict crown and foliage weights better in small trees than large trees. Of the western equations, Brown's (1978) white bark pine equation best predicts observed pitch pine foliage weight with a  $MS_{Residual}$  value of 87.00 versus 99.47 for ponderosa pine, and 164.09 for lodgepole pine. The mean absolute distance between observed and predicted foliage weight was 3.1 kg for lodgepole pine, 2.8 kg for ponderosa pine, and 3.3 kg for white bark pine.

Brown's equation does not represent the range of crown classes that are prone to crown fire. He sampled only 19 dominant trees compared to my 31 pitch pine trees from all four-crown classes. His objective was to predict the potential slash left behind following a harvest rather than the fuel available for a potential crown fire. In addition, his methods did not include the intensive sampling of foliage that I sampled in order to capture the variability of the small size classes available for the active spread of a crown fire. Reinhardt et al.'s data come from more than 80 sample stems per species from a full range of crown classes, and their work focused specifically on crown fire potential.

My pitch pine equation had a  $MS_{Residual}$  value of 56.93 for foliage weight; 30.1 less than Brown's white bark pine equation. The mean absolute difference between the observed and predicted values for my pitch pine equation was 2.1 kg for foliage weight; 0.7 kg less than western equations. My equations thus provide the best available method for predicting available crown fuels for pitch pine.

### **Demonstrating CBD Inputs For Crowning Index**

To demonstrate the application of canopy bulk density (CBD) in fire management, I calculated crowning index for untreated and thinned stands of pitch pine at Montague Plains Wildlife Management Area. The thinned stand was treated as part of a crown fuel reduction project implemented in early spring, 2004 (Patterson and Crary 2004). During August, 2004, I collected stand inventory data and calculated CBD in both the thinned and a nearby untreated stand of pitch pine. Using a stratified random sampling technique, I sampled 12 and 15, 0.04 ha (0.1 acre) fixed radius plots in the

untreated and treated stands respectively. At each plot, I measured dbh, crown base height, crown height, and crown class of each live pitch pine stem in the plot.

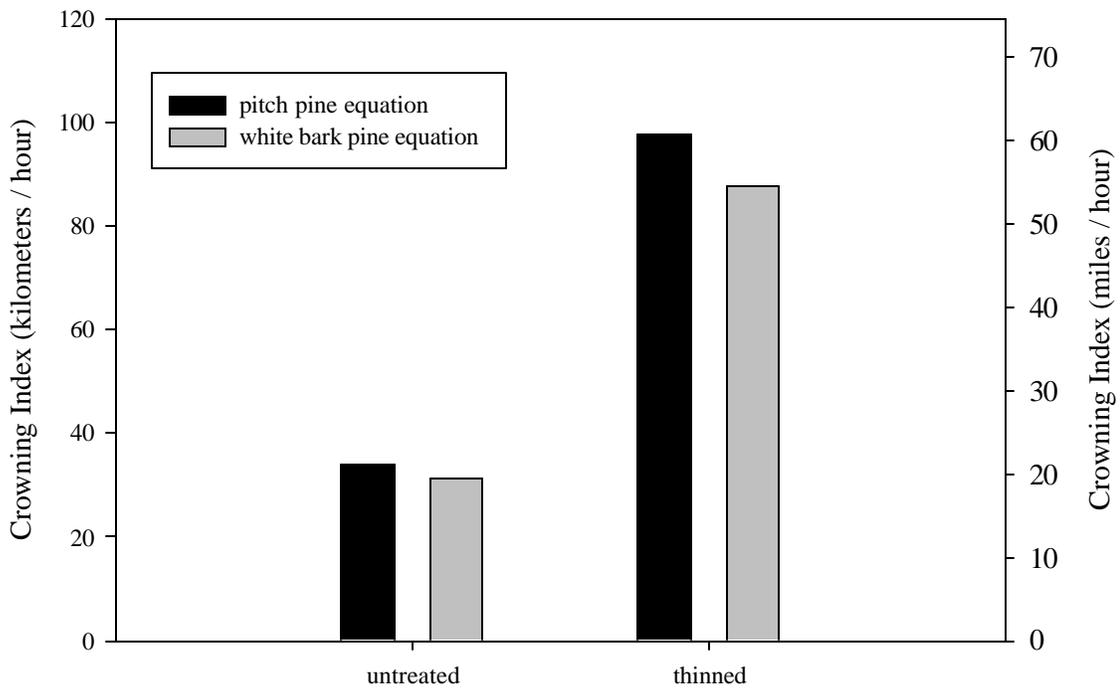
For each stem tallied, I calculated the available fuel using the equations that I developed (Table 6), assuming that available fuel includes foliage and 50% of the branchwood < 0.6 cm (0.25 inch) in diameter. Using techniques demonstrated in Scott and Reinhardt (2001), I distributed the tree's available fuel evenly throughout the vertical canopy depth (crown height minus crown base height) in 1-meter (3.3 ft) height increments. Next, I summed the height increments by plot and divided the 1-meter increment crown weight by the plot area. Finally, I determined the CBD to be the maximum 3-meter running mean of those height increments. I found the maximum CBD value of the twelve untreated plots to be 0.132 kg/m<sup>3</sup> (representing worst case conditions) and the maximum CBD value for the thinned stand to be 0.03 kg/m<sup>3</sup>.

Because modeling the growth of crowns following thinning experiments in pitch pine has not been attempted, I used the same crown weight equations for the thinned stand. Over time, open grown trees following thinning would likely produce longer branches and more foliage. Diameter, the main input to the weight equations, as well as biomass will increase following thinning. How the relationship between dbh and crown component weight will change over time is unknown.

I used the crown fire behavior software NEXUS (Scott 1999) to calculate crowning index (CI), defined as the 6.1 meter (20 ft) above the canopy wind speed at which active crown fire will be sustained. To calculate CI, NEXUS uses CBD, surface fuel moisture, and slope. I used the estimated CBD calculated for the two stands, standard surface fuel moistures for early spring (Rothermel 1991), and a slope of 0%.

Results suggest that active crown fire is possible with 6.1m (20 ft) wind speeds of 34 km/hr (21.1 mile/hr) in the uncut stand and 97.6 km/hr (60.6 mile/hr) in the thinned stand (Figure 9).

Figure 9. Crowning index is affected by thinning a pitch pine stand at Montague. The white bark pine equation predicts a slightly lower crowning index than the pitch pine equation for both the control and thinned stands.



Using the same techniques and inventory data from Montague, I calculated CBD for the two stands using Brown's (1978) white bark pine equation. Values are 0.118 kg/m<sup>3</sup> and 0.0353 kg/m<sup>3</sup> for the untreated and thinned stand respectively -- 0.005 kg/m<sup>3</sup> and 0.002 kg/m<sup>3</sup> more than for the two comparable pitch pine equations. The white bark pine equation predicts CI's that are 10.0 km/hr (6.2 mi/hr) and 2.9 km/hr (1.8 mi/hr) less than the pitch pine equations. Thus white bark pine over predicts crown fire hazard

compared to pitch pine. I did not sample enough stands to determine if these differences are significant.

## CHAPTER 5

### CONCLUSIONS

#### Predictive Model Choice

Originally I sought to determine if pitch pine canopy fuels could be predicted using existing equations for western species. I found predictive equations from the three western species that I examined with  $MS_{Residual}$  values as low as 87.00 for foliage weight. However, I found no equation that predicted pitch pine as well as my own derived from sampling 31 pitch pine trees ( $MS_{Residual}$  values of 56.93 for foliage weight). After sampling more stems than I had originally planned, I was able to develop unique models that are the best available for predicting pitch pine canopy fuels.

Managers interested in predicting crown fire behavior in pitch pine can use the equations developed in this study in conjunction with existing fire behavior models to predict site-specific crown fire behavior. Managers will need to inventory dbh, crown base height, tree height, and, optionally, crown class. Managers can then calculate available fuel using the equations in Table 5 or 6 and the Scott and Reinhardt (2001) method of predicting CBD as the maximum three-meter running mean of one-meter height increments. Knowing CBD, pitch pine fire modelers can use either Scott and Reinhardt's (2001) method of linking surface fire behavior to crown fire behavior with the NEXUS software or the Crowning Index to determine the wind speed required to sustain active crowning at different CBD values.

### **Further Work In Pitch Pine Canopy Fuel Characterization**

My data are most applicable to the conditions represented by the three tall, dense stands that I sampled. Stands with lower densities, which I did not sample, are less prone to crown fire. With more space between the crowns, these stands should have lower CBD and require higher wind speeds to support active crown fire. Individual, open-grown trees may, however, have longer branches and more foliage resulting in more crown fuels per tree. Although open grown stands of pitch pine are generally of less concern to fire managers from a crown fire perspective, further research would quantify the extent to which that concern might be reduced. I don't expect the equations presented here to predict crowning potential for stunted pitch pine growing on shallow, rocky soils at higher elevations (e.g. at the Shawangunk Mountains in New York or at Acadia National Park in Maine) or the pigmy pitch pine barrens of Long Island and New Jersey. These stands are characterized by crown structures that I did not sample.

Crown fires can occur across the range of pitch pine where it occurs as closed-canopy stands on deep sandy soils. In addition to sampling a larger range of stand densities, further research in pitch pine crown fuels should focus on sampling pitch pine from a larger geographic area.

Canopy fuel sampling has become a priority for fire research at the national level. As we develop fuel models and methods for sampling in the Northeast, it is important that we exchange knowledge and ideas with our western partners. The plot inventory technique that I demonstrate in Figure 9 assumes uniformity beyond the range of the twelve fixed radius plots that I sampled. Future fuel sampling may use light gap fraction measurements on the forest floor (Keane et al., in prep.), and remote sensing tools from

an airplane platform to model canopy fuel characteristics (Andersen et al., in prep.). The ability to determine canopy fuel characteristics with remote sensing platforms will allow better characterization of the variability of canopy bulk density across a large area. The current method of interpolating plot inventories to entire stands and forests might be replaced by a sensor that could scan an entire forest and make possible canopy fuel characteristics with sub-meter precision.

As fire behavior modeling develops to include more landscape level fire behavior predictions, so must our ability to provide ground truth data to fit the models. In order to effectively predict crown fires in the Northeast, it is important that our measurements be compatible with new methods being developed. My study demonstrates the ability to characterize pitch pine crown fuels directly in a way that is compatible with crown fire behavior models developed elsewhere.

## APPENDIX A

### RELATIONSHIP BETWEEN NEEDLE LENGTH AND NEEDLE WEIGHT

Figure A.1 shows a linear regression equation with the dependent variable the log natural weight and the independent variable the log natural length for 50 needles per sample day ( $r^2=0.88$ ). Using this length to weight relationship, I adjusted the early 2003 needle weights to mature weights based on the regression equation for daily length differences between old and new needles. This adjustment assumes that new, underdeveloped needles will eventually have similar lengths and therefore weights as the fully developed older needles.

Figure A.2 shows the mean length of 50 developing needles per sample day as a function of time. The horizontal line represents the average length of mature, one-year-old needles collected every sample day (85.7 mm). The date at which the regression line (needle length as a function of time) crossed the mean length of mature needles (8/16) indicated the date after which I no longer needed to adjust the weight of developing needles.

Figure A.1. Needle weight as a function of needle length. There is a direct relationship between weight and length supporting the decision to adjust the weight of the developing 2003 needles based on the length difference by sample day.

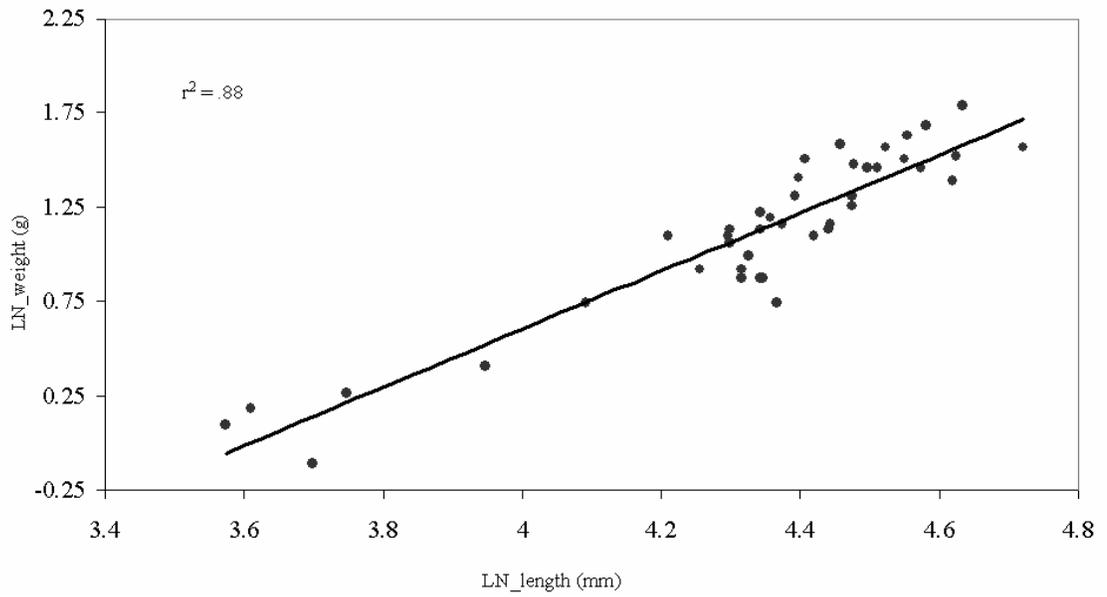
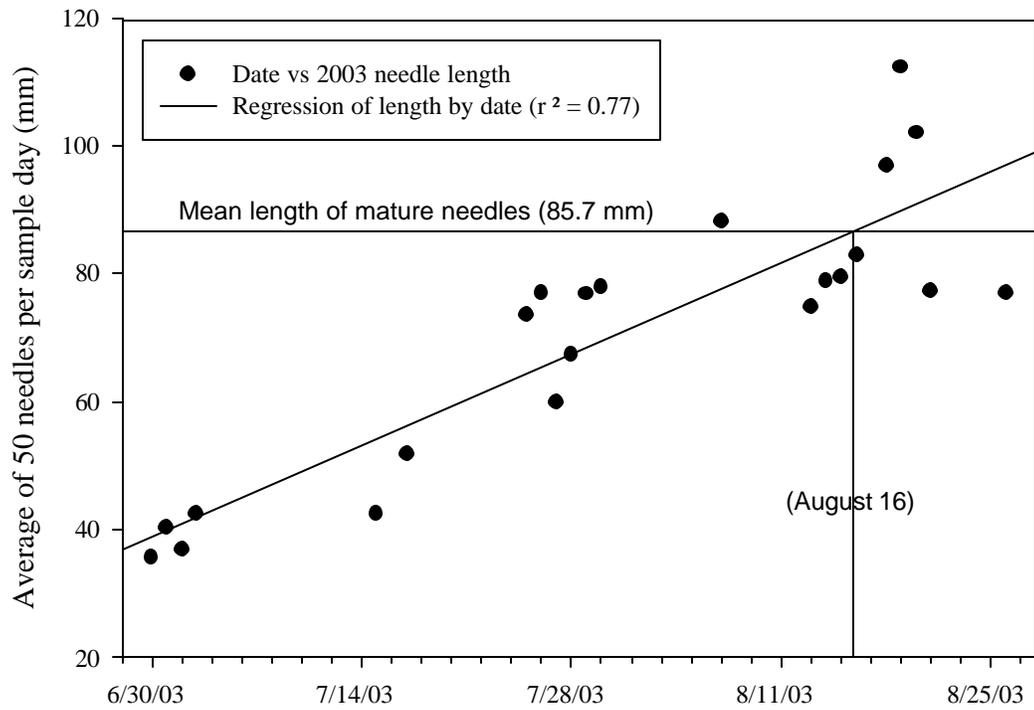


Figure A.2 Developing needle length as a function of date. The mean length of 50 mature needles is shown with the horizontal line. The date (August 16) at which the regression line crossed the line of mature needle length determined when I no longer needed to adjust the weight of developing needles.



## APPENDIX B

### NEW NEEDLE LENGTH ADJUSTMENT DATA

These data are the needle lengths of 50 needles per sampling day. They represent a random sample of 50 needle lengths measured in millimeters from both the 2003 (LE03) and 2002 (LE02) needles. In addition, each 50-needle sample group was dried in a 70 degree C. oven for 72 hours and weighed. WE03 and WE02 represent the dry weight in grams of each needle group from both 2003 and 2002 respectively. ST represents the sample trees that the needles came from and DA represents the date that the needles were harvested.

ST	DA	LE02	LE03	WE03	WE02
27,4,8,31	06/30/03	35.2	67.2	0.9	2.4
27,4,8,31	06/30/03	18.6	98.6	0.9	2.4
27,4,8,31	06/30/03	42.8	62.9	0.9	2.4
27,4,8,31	06/30/03	42.3	65.5	0.9	2.4
27,4,8,31	06/30/03	45.4	76.9	0.9	2.4
27,4,8,31	06/30/03	43.3	95.7	0.9	2.4
27,4,8,31	06/30/03	42.7	100.0	0.9	2.4
27,4,8,31	06/30/03	45.0	57.5	0.9	2.4
27,4,8,31	06/30/03	43.6	61.3	0.9	2.4
27,4,8,31	06/30/03	36.8	58.8	0.9	2.4
27,4,8,31	06/30/03	38.1	75.2	0.9	2.4
27,4,8,31	06/30/03	31.8	77.6	0.9	2.4
27,4,8,31	06/30/03	32.2	83.5	0.9	2.4
27,4,8,31	06/30/03	36.8	106.5	0.9	2.4
27,4,8,31	06/30/03	31.5	94.5	0.9	2.4
27,4,8,31	06/30/03	43.4	98.0	0.9	2.4
27,4,8,31	06/30/03	44.6	99.4	0.9	2.4
27,4,8,31	06/30/03	39.0	72.2	0.9	2.4
27,4,8,31	06/30/03	27.4	88.7	0.9	2.4
27,4,8,31	06/30/03	37.9	64.9	0.9	2.4
27,4,8,31	06/30/03	25.4	64.3	0.9	2.4
27,4,8,31	06/30/03	26.7	86.0	0.9	2.4
27,4,8,31	06/30/03	31.8	59.9	0.9	2.4
27,4,8,31	06/30/03	41.4	60.2	0.9	2.4
27,4,8,31	06/30/03	43.5	93.3	0.9	2.4
27,4,8,31	06/30/03	29.3	76.8	0.9	2.4
27,4,8,31	06/30/03	33.9	94.7	0.9	2.4
27,4,8,31	06/30/03	23.9	89.9	0.9	2.4

ST	DA	LE02	LE03	WE03	WE02
49	07/30/03	83.2	103.7	3.3	4.9
49	07/30/03	78.9	79.2	3.3	4.9
49	07/30/03	75.3	93.3	3.3	4.9
49	07/30/03	89.4	92.3	3.3	4.9
49	07/30/03	61.1	79.1	3.3	4.9
49	07/30/03	65.6	40.7	3.3	4.9
49	07/30/03	66.8	67.2	3.3	4.9
49	07/30/03	81.8	100.3	3.3	4.9
49	07/30/03	89.0	70.4	3.3	4.9
49	07/30/03	71.5	83.9	3.3	4.9
49	07/30/03	79.6	82.1	3.3	4.9
49	07/30/03	81.5	76.4	3.3	4.9
49	07/30/03	86.9	76.5	3.3	4.9
49	07/30/03	76.9	76.8	3.3	4.9
49	07/30/03	63.1	109.7	3.3	4.9
49	07/30/03	74.6	91.1	3.3	4.9
49	07/30/03	68.8	90.9	3.3	4.9
49	07/30/03	83.5	108.6	3.3	4.9
49	07/30/03	62.5	105.5	3.3	4.9
49	07/30/03	74.0	93.2	3.3	4.9
49	07/30/03	82.6	99.2	3.3	4.9
49	07/30/03	89.1	105.6	3.3	4.9
49	07/30/03	88.2	67.3	3.3	4.9
49	07/30/03	86.4	116.3	3.3	4.9
49	07/30/03	90.4	94.6	3.3	4.9
49	07/30/03	79.8	49.0	3.3	4.9
49	07/30/03	88.7	78.0	3.3	4.9
49	07/30/03	76.9	76.5	3.3	4.9

27,4,8,31	06/30/03	41.5	46.1	0.9	2.4
27,4,8,31	06/30/03	43.1	65.7	0.9	2.4
27,4,8,31	06/30/03	28.3	90.2	0.9	2.4
27,4,8,31	06/30/03	26.1	65.3	0.9	2.4
27,4,8,31	06/30/03	35.7	70.2	0.9	2.4
27,4,8,31	06/30/03	30.2	63.0	0.9	2.4
27,4,8,31	06/30/03	28.4	62.9	0.9	2.4
27,4,8,31	06/30/03	34.7	55.9	0.9	2.4
27,4,8,31	06/30/03	41.1	43.6	0.9	2.4
27,4,8,31	06/30/03	39.1	45.4	0.9	2.4
27,4,8,31	06/30/03	37.9	64.4	0.9	2.4
27,4,8,31	06/30/03	31.5	66.8	0.9	2.4
27,4,8,31	06/30/03	28.6	63.7	0.9	2.4
27,4,8,31	06/30/03	31.0	69.5	0.9	2.4
27,4,8,31	06/30/03	35.2	83.5	0.9	2.4
27,4,8,31	06/30/03	39.2	78.6	0.9	2.4
27,4,8,31	06/30/03	34.2	88.3	0.9	2.4
27,4,8,31	06/30/03	32.7	68.8	0.9	2.4
27,4,8,31	06/30/03	33.3	88.1	0.9	2.4
27,4,8,31	06/30/03	37.1	88.6	0.9	2.4
27,4,8,31	06/30/03	38.1	66.6	0.9	2.4
27,4,8,31	06/30/03	40.0	74.4	0.9	2.4
15,19	07/01/03	47.2	72.7	1.1	3.2
15,19	07/01/03	38.0	78.7	1.1	3.2
15,19	07/01/03	32.6	82.9	1.1	3.2
15,19	07/01/03	46.2	99.8	1.1	3.2
15,19	07/01/03	48.6	89.5	1.1	3.2
15,19	07/01/03	43.4	82.1	1.1	3.2
15,19	07/01/03	33.0	55.5	1.1	3.2
15,19	07/01/03	49.1	77.6	1.1	3.2
15,19	07/01/03	47.8	95.1	1.1	3.2
15,19	07/01/03	51.8	70.8	1.1	3.2
15,19	07/01/03	32.8	70.3	1.1	3.2
15,19	07/01/03	35.3	100.7	1.1	3.2
15,19	07/01/03	41.0	80.7	1.1	3.2
15,19	07/01/03	49.4	90.7	1.1	3.2
15,19	07/01/03	54.7	74.7	1.1	3.2
15,19	07/01/03	31.6	81.4	1.1	3.2
15,19	07/01/03	40.2	81.2	1.1	3.2
15,19	07/01/03	34.9	70.5	1.1	3.2
15,19	07/01/03	33.3	84.9	1.1	3.2
15,19	07/01/03	42.8	71.5	1.1	3.2
15,19	07/01/03	32.3	100.7	1.1	3.2
15,19	07/01/03	31.7	81.8	1.1	3.2
15,19	07/01/03	40.2	91.5	1.1	3.2
15,19	07/01/03	51.3	86.0	1.1	3.2
15,19	07/01/03	33.6	89.6	1.1	3.2
15,19	07/01/03	37.0	89.7	1.1	3.2
15,19	07/01/03	44.8	87.5	1.1	3.2
15,19	07/01/03	43.9	98.1	1.1	3.2
15,19	07/01/03	30.9	70.0	1.1	3.2
15,19	07/01/03	34.2	97.7	1.1	3.2
15,19	07/01/03	29.4	81.1	1.1	3.2
15,19	07/01/03	37.6	89.1	1.1	3.2

49	07/30/03	83.3	41.6	3.3	4.9
49	07/30/03	87.0	88.5	3.3	4.9
49	07/30/03	78.8	74.9	3.3	4.9
49	07/30/03	77.9	94.6	3.3	4.9
49	07/30/03	74.1	108.2	3.3	4.9
49	07/30/03	80.3	86.6	3.3	4.9
49	07/30/03	68.7	108.5	3.3	4.9
49	07/30/03	90.3	62.2	3.3	4.9
49	07/30/03	75.8	54.3	3.3	4.9
49	07/30/03	87.7	94.3	3.3	4.9
49	07/30/03	78.7	93.4	3.3	4.9
49	07/30/03	69.9	71.5	3.3	4.9
49	07/30/03	71.8	110.7	3.3	4.9
49	07/30/03	78.9	93.8	3.3	4.9
49	07/30/03	76.7	102.0	3.3	4.9
49	07/30/03	59.0	76.7	3.3	4.9
49	07/30/03	79.9	93.6	3.3	4.9
49	07/30/03	74.1	90.0	3.3	4.9
49	07/30/03	83.9	90.7	3.3	4.9
49	07/30/03	80.9	93.5	3.3	4.9
49	07/30/03	83.6	89.4	3.3	4.9
49	07/30/03	60.1	91.9	3.3	4.9
39	08/07/03	72.7	108.7	4.4	5.4
39	08/07/03	51.0	85.8	4.4	5.4
39	08/07/03	90.8	99.5	4.4	5.4
39	08/07/03	61.1	73.8	4.4	5.4
39	08/07/03	73.7	81.5	4.4	5.4
39	08/07/03	74.0	96.0	4.4	5.4
39	08/07/03	85.0	108.6	4.4	5.4
39	08/07/03	43.2	81.6	4.4	5.4
39	08/07/03	80.0	96.7	4.4	5.4
39	08/07/03	42.7	94.9	4.4	5.4
39	08/07/03	102.7	132.8	4.4	5.4
39	08/07/03	97.3	76.7	4.4	5.4
39	08/07/03	92.0	72.0	4.4	5.4
39	08/07/03	84.1	86.8	4.4	5.4
39	08/07/03	120.9	96.6	4.4	5.4
39	08/07/03	71.5	115.6	4.4	5.4
39	08/07/03	78.2	112.8	4.4	5.4
39	08/07/03	100.7	114.0	4.4	5.4
39	08/07/03	97.6	70.7	4.4	5.4
39	08/07/03	73.1	106.7	4.4	5.4
39	08/07/03	75.6	97.7	4.4	5.4
39	08/07/03	98.7	92.6	4.4	5.4
39	08/07/03	102.9	86.6	4.4	5.4
39	08/07/03	87.2	101.7	4.4	5.4
39	08/07/03	88.3	103.4	4.4	5.4
39	08/07/03	102.7	107.1	4.4	5.4
39	08/07/03	100.8	107.7	4.4	5.4
39	08/07/03	99.7	110.2	4.4	5.4
39	08/07/03	78.1	112.2	4.4	5.4
39	08/07/03	100.5	85.0	4.4	5.4
39	08/07/03	99.5	99.1	4.4	5.4
39	08/07/03	99.9	101.1	4.4	5.4

15.19	07/01/03	50.6	75.6	1.1	3.2
15.19	07/01/03	47.3	61.2	1.1	3.2
15.19	07/01/03	33.8	100.7	1.1	3.2
15.19	07/01/03	34.1	98.3	1.1	3.2
15.19	07/01/03	46.2	87.2	1.1	3.2
15.19	07/01/03	51.3	100.4	1.1	3.2
15.19	07/01/03	55.1	77.8	1.1	3.2
15.19	07/01/03	46.8	94.0	1.1	3.2
15.19	07/01/03	31.5	69.1	1.1	3.2
15.19	07/01/03	35.3	84.4	1.1	3.2
15.19	07/01/03	26.5	99.4	1.1	3.2
15.19	07/01/03	26.9	92.5	1.1	3.2
15.19	07/01/03	46.1	88.7	1.1	3.2
15.19	07/01/03	40.5	93.6	1.1	3.2
15.19	07/01/03	42.8	78.3	1.1	3.2
15.19	07/01/03	39.8	80.6	1.1	3.2
15.19	07/01/03	36.6	99.9	1.1	3.2
15.19	07/01/03	48.7	96.0	1.1	3.2
1	07/02/03	39.0	93.3	1.2	4.1
1	07/02/03	48.4	103.9	1.2	4.1
1	07/02/03	43.0	82.6	1.2	4.1
1	07/02/03	31.8	74.4	1.2	4.1
1	07/02/03	40.4	89.2	1.2	4.1
1	07/02/03	46.5	88.1	1.2	4.1
1	07/02/03	47.2	85.5	1.2	4.1
1	07/02/03	38.2	92.9	1.2	4.1
1	07/02/03	44.4	78.9	1.2	4.1
1	07/02/03	31.4	74.3	1.2	4.1
1	07/02/03	35.6	89.6	1.2	4.1
1	07/02/03	28.0	91.3	1.2	4.1
1	07/02/03	41.6	76.5	1.2	4.1
1	07/02/03	24.8	96.1	1.2	4.1
1	07/02/03	36.6	99.9	1.2	4.1
1	07/02/03	39.4	67.2	1.2	4.1
1	07/02/03	35.5	97.8	1.2	4.1
1	07/02/03	29.7	78.9	1.2	4.1
1	07/02/03	46.7	96.7	1.2	4.1
1	07/02/03	30.1	87.1	1.2	4.1
1	07/02/03	41.6	82.5	1.2	4.1
1	07/02/03	40.8	89.8	1.2	4.1
1	07/02/03	24.8	92.7	1.2	4.1
1	07/02/03	29.8	59.6	1.2	4.1
1	07/02/03	25.9	79.3	1.2	4.1
1	07/02/03	44.0	91.3	1.2	4.1
1	07/02/03	37.9	100.1	1.2	4.1
1	07/02/03	41.8	84.4	1.2	4.1
1	07/02/03	37.0	102.4	1.2	4.1
1	07/02/03	36.0	82.8	1.2	4.1
1	07/02/03	34.3	82.6	1.2	4.1
1	07/02/03	37.1	61.6	1.2	4.1
1	07/02/03	37.7	64.9	1.2	4.1
1	07/02/03	38.3	97.6	1.2	4.1
1	07/02/03	31.5	80.6	1.2	4.1
1	07/02/03	33.5	62.3	1.2	4.1

39	08/07/03	103.4	84.4	4.4	5.4
39	08/07/03	103.3	117.4	4.4	5.4
39	08/07/03	91.4	113.9	4.4	5.4
39	08/07/03	99.2	104.1	4.4	5.4
39	08/07/03	75.8	105.2	4.4	5.4
39	08/07/03	83.4	95.1	4.4	5.4
39	08/07/03	101.9	115.6	4.4	5.4
39	08/07/03	80.8	104.0	4.4	5.4
39	08/07/03	107.1	105.3	4.4	5.4
39	08/07/03	105.4	80.6	4.4	5.4
39	08/07/03	110.2	82.4	4.4	5.4
39	08/07/03	105.7	65.4	4.4	5.4
39	08/07/03	78.5	94.7	4.4	5.4
39	08/07/03	98.6	123.4	4.4	5.4
39	08/07/03	87.1	108.7	4.4	5.4
39	08/07/03	83.5	71.5	4.4	5.4
39	08/07/03	84.5	90.1	4.4	5.4
39	08/07/03	77.9	97.4	4.4	5.4
36	08/13/03	75.2	76.0	2.5	2.5
36	08/13/03	79.2	67.5	2.5	2.5
36	08/13/03	81.7	61.2	2.5	2.5
36	08/13/03	78.5	58.5	2.5	2.5
36	08/13/03	77.9	67.6	2.5	2.5
36	08/13/03	80.2	63.2	2.5	2.5
36	08/13/03	75.3	48.6	2.5	2.5
36	08/13/03	94.4	52.8	2.5	2.5
36	08/13/03	83.9	57.8	2.5	2.5
36	08/13/03	77.2	61.7	2.5	2.5
36	08/13/03	84.6	68.1	2.5	2.5
36	08/13/03	77.7	65.7	2.5	2.5
36	08/13/03	84.3	64.0	2.5	2.5
36	08/13/03	66.5	50.6	2.5	2.5
36	08/13/03	87.4	64.4	2.5	2.5
36	08/13/03	67.2	69.2	2.5	2.5
36	08/13/03	86.7	75.0	2.5	2.5
36	08/13/03	84.4	70.6	2.5	2.5
36	08/13/03	86.8	65.0	2.5	2.5
36	08/13/03	79.3	68.7	2.5	2.5
36	08/13/03	85.1	78.7	2.5	2.5
36	08/13/03	76.2	89.3	2.5	2.5
36	08/13/03	80.3	78.2	2.5	2.5
36	08/13/03	40.9	67.2	2.5	2.5
36	08/13/03	72.1	79.4	2.5	2.5
36	08/13/03	82.3	56.1	2.5	2.5
36	08/13/03	76.2	88.1	2.5	2.5
36	08/13/03	72.3	95.0	2.5	2.5
36	08/13/03	45.1	71.0	2.5	2.5
36	08/13/03	83.7	72.8	2.5	2.5
36	08/13/03	78.8	73.5	2.5	2.5
36	08/13/03	74.0	51.1	2.5	2.5
36	08/13/03	69.3	78.2	2.5	2.5
36	08/13/03	66.6	85.3	2.5	2.5
36	08/13/03	72.7	73.8	2.5	2.5
36	08/13/03	70.3	79.7	2.5	2.5

1	07/02/03	34.6	80.5	1.2	4.1
1	07/02/03	29.7	64.0	1.2	4.1
1	07/02/03	39.8	52.6	1.2	4.1
1	07/02/03	39.1	62.6	1.2	4.1
1	07/02/03	44.7	51.7	1.2	4.1
1	07/02/03	38.8	85.9	1.2	4.1
1	07/02/03	34.4	80.9	1.2	4.1
1	07/02/03	35.5	77.3	1.2	4.1
1	07/02/03	38.3	73.2	1.2	4.1
1	07/02/03	34.7	90.4	1.2	4.1
1	07/02/03	40.0	93.7	1.2	4.1
1	07/02/03	33.0	77.5	1.2	4.1
1	07/02/03	33.7	56.9	1.2	4.1
1	07/02/03	40.2	61.2	1.2	4.1
3	07/03/03	43.2	114.1	1.3	3.7
3	07/03/03	48.7	105.3	1.3	3.7
3	07/03/03	37.3	98.4	1.3	3.7
3	07/03/03	47.8	101.6	1.3	3.7
3	07/03/03	43.0	96.0	1.3	3.7
3	07/03/03	47.6	74.4	1.3	3.7
3	07/03/03	48.9	57.0	1.3	3.7
3	07/03/03	41.5	80.9	1.3	3.7
3	07/03/03	39.0	110.4	1.3	3.7
3	07/03/03	43.9	108.5	1.3	3.7
3	07/03/03	32.6	99.8	1.3	3.7
3	07/03/03	34.9	82.8	1.3	3.7
3	07/03/03	39.5	110.7	1.3	3.7
3	07/03/03	43.8	113.4	1.3	3.7
3	07/03/03	37.2	103.0	1.3	3.7
3	07/03/03	37.9	105.4	1.3	3.7
3	07/03/03	43.1	63.0	1.3	3.7
3	07/03/03	38.3	94.8	1.3	3.7
3	07/03/03	45.4	68.6	1.3	3.7
3	07/03/03	43.7	96.4	1.3	3.7
3	07/03/03	37.9	91.7	1.3	3.7
3	07/03/03	37.8	83.2	1.3	3.7
3	07/03/03	48.4	79.2	1.3	3.7
3	07/03/03	46.6	81.6	1.3	3.7
3	07/03/03	45.1	68.6	1.3	3.7
3	07/03/03	42.3	91.3	1.3	3.7
3	07/03/03	48.5	108.4	1.3	3.7
3	07/03/03	45.3	84.8	1.3	3.7
3	07/03/03	41.4	99.0	1.3	3.7
3	07/03/03	38.8	81.8	1.3	3.7
3	07/03/03	43.1	101.6	1.3	3.7
3	07/03/03	29.8	84.5	1.3	3.7
3	07/03/03	40.6	91.0	1.3	3.7
3	07/03/03	48.9	86.4	1.3	3.7
3	07/03/03	39.4	88.4	1.3	3.7
3	07/03/03	44.4	93.8	1.3	3.7
3	07/03/03	38.6	80.6	1.3	3.7
3	07/03/03	39.3	86.4	1.3	3.7
3	07/03/03	34.5	71.3	1.3	3.7
3	07/03/03	47.3	88.3	1.3	3.7

36	08/13/03	76.7	92.5	2.5	2.5
36	08/13/03	87.9	81.4	2.5	2.5
36	08/13/03	56.9	67.2	2.5	2.5
36	08/13/03	40.8	63.0	2.5	2.5
36	08/13/03	74.0	63.2	2.5	2.5
36	08/13/03	64.0	82.2	2.5	2.5
36	08/13/03	77.2	71.0	2.5	2.5
36	08/13/03	78.3	67.4	2.5	2.5
36	08/13/03	79.9	83.9	2.5	2.5
36	08/13/03	58.3	70.1	2.5	2.5
36	08/13/03	76.2	67.8	2.5	2.5
36	08/13/03	74.8	73.3	2.5	2.5
36	08/13/03	80.2	51.9	2.5	2.5
36	08/13/03	59.6	94.1	2.5	2.5
40,44	08/14/03	79.9	94.8	2.1	2.7
40,44	08/14/03	69.9	69.8	2.1	2.7
40,44	08/14/03	83.0	71.3	2.1	2.7
40,44	08/14/03	69.9	77.2	2.1	2.7
40,44	08/14/03	79.9	73.6	2.1	2.7
40,44	08/14/03	75.9	70.3	2.1	2.7
40,44	08/14/03	94.5	82.5	2.1	2.7
40,44	08/14/03	77.1	80.6	2.1	2.7
40,44	08/14/03	74.7	76.1	2.1	2.7
40,44	08/14/03	77.8	73.4	2.1	2.7
40,44	08/14/03	89.7	81.9	2.1	2.7
40,44	08/14/03	81.9	82.6	2.1	2.7
40,44	08/14/03	89.1	79.2	2.1	2.7
40,44	08/14/03	78.3	82.3	2.1	2.7
40,44	08/14/03	82.8	82.1	2.1	2.7
40,44	08/14/03	76.2	81.8	2.1	2.7
40,44	08/14/03	79.9	81.8	2.1	2.7
40,44	08/14/03	74.9	79.8	2.1	2.7
40,44	08/14/03	78.2	81.3	2.1	2.7
40,44	08/14/03	76.0	97.6	2.1	2.7
40,44	08/14/03	84.7	64.6	2.1	2.7
40,44	08/14/03	77.1	75.0	2.1	2.7
40,44	08/14/03	80.9	70.6	2.1	2.7
40,44	08/14/03	83.0	72.5	2.1	2.7
40,44	08/14/03	77.2	73.9	2.1	2.7
40,44	08/14/03	76.2	83.6	2.1	2.7
40,44	08/14/03	80.5	77.6	2.1	2.7
40,44	08/14/03	74.4	66.8	2.1	2.7
40,44	08/14/03	80.2	69.9	2.1	2.7
40,44	08/14/03	78.8	72.4	2.1	2.7
40,44	08/14/03	82.1	80.9	2.1	2.7
40,44	08/14/03	80.4	75.7	2.1	2.7
40,44	08/14/03	79.5	71.3	2.1	2.7
40,44	08/14/03	87.5	76.9	2.1	2.7
40,44	08/14/03	85.0	78.1	2.1	2.7
40,44	08/14/03	83.5	72.1	2.1	2.7
40,44	08/14/03	80.4	69.8	2.1	2.7
40,44	08/14/03	79.6	69.9	2.1	2.7
40,44	08/14/03	82.0	73.7	2.1	2.7
40,44	08/14/03	46.7	64.2	2.1	2.7

3	07/03/03	42.0	68.2	1.3	3.7
3	07/03/03	47.8	95.0	1.3	3.7
3	07/03/03	42.0	77.3	1.3	3.7
3	07/03/03	36.7	71.7	1.3	3.7
3	07/03/03	47.2	75.3	1.3	3.7
3	07/03/03	44.8	95.8	1.3	3.7
3	07/03/03	48.3	78.2	1.3	3.7
3	07/03/03	48.2	69.3	1.3	3.7
3	07/03/03	40.2	74.4	1.3	3.7
3	07/03/03	47.0	57.6	1.3	3.7
21	07/15/03	49.1	65.3	1.3	3.1
21	07/15/03	48.3	82.2	1.3	3.1
21	07/15/03	27.1	30.7	1.3	3.1
21	07/15/03	48.9	75.8	1.3	3.1
21	07/15/03	40.4	79.3	1.3	3.1
21	07/15/03	45.8	71.3	1.3	3.1
21	07/15/03	47.7	76.0	1.3	3.1
21	07/15/03	42.6	87.8	1.3	3.1
21	07/15/03	36.9	73.8	1.3	3.1
21	07/15/03	44.2	57.4	1.3	3.1
21	07/15/03	33.5	80.2	1.3	3.1
21	07/15/03	36.7	77.4	1.3	3.1
21	07/15/03	36.4	80.7	1.3	3.1
21	07/15/03	38.2	73.7	1.3	3.1
21	07/15/03	48.6	48.2	1.3	3.1
21	07/15/03	40.5	74.9	1.3	3.1
21	07/15/03	34.5	84.2	1.3	3.1
21	07/15/03	40.6	72.0	1.3	3.1
21	07/15/03	46.0	76.2	1.3	3.1
21	07/15/03	50.8	80.5	1.3	3.1
21	07/15/03	34.3	60.7	1.3	3.1
21	07/15/03	56.8	58.0	1.3	3.1
21	07/15/03	24.8	53.9	1.3	3.1
21	07/15/03	53.7	61.8	1.3	3.1
21	07/15/03	34.5	97.7	1.3	3.1
21	07/15/03	48.8	81.2	1.3	3.1
21	07/15/03	36.1	87.4	1.3	3.1
21	07/15/03	44.0	89.1	1.3	3.1
21	07/15/03	53.0	80.9	1.3	3.1
21	07/15/03	40.0	79.4	1.3	3.1
21	07/15/03	43.2	82.5	1.3	3.1
21	07/15/03	41.6	51.5	1.3	3.1
21	07/15/03	44.1	88.2	1.3	3.1
21	07/15/03	48.7	66.9	1.3	3.1
21	07/15/03	26.1	71.2	1.3	3.1
21	07/15/03	37.1	90.7	1.3	3.1
21	07/15/03	36.0	70.0	1.3	3.1
21	07/15/03	52.4	83.1	1.3	3.1
21	07/15/03	45.6	76.2	1.3	3.1
21	07/15/03	40.5	72.5	1.3	3.1
21	07/15/03	39.9	87.9	1.3	3.1
21	07/15/03	52.0	40.3	1.3	3.1
21	07/15/03	45.7	81.3	1.3	3.1
21	07/15/03	49.1	89.4	1.3	3.1

40,44	08/14/03	79.8	61.7	2.1	2.7
40,44	08/14/03	74.7	68.1	2.1	2.7
40,44	08/14/03	81.7	81.4	2.1	2.7
40,44	08/14/03	78.0	67.2	2.1	2.7
40,44	08/14/03	81.2	74.2	2.1	2.7
40,44	08/14/03	78.3	72.5	2.1	2.7
40,44	08/14/03	77.2	71.1	2.1	2.7
40,44	08/14/03	69.3	77.1	2.1	2.7
40,44	08/14/03	77.0	73.8	2.1	2.7
40,44	08/14/03	70.3	73.1	2.1	2.7
42	08/15/03	87.2	81.3	3.2	3.4
42	08/15/03	89.2	68.0	3.2	3.4
42	08/15/03	79.5	82.7	3.2	3.4
42	08/15/03	87.2	70.2	3.2	3.4
42	08/15/03	74.1	71.2	3.2	3.4
42	08/15/03	88.0	77.8	3.2	3.4
42	08/15/03	85.3	81.6	3.2	3.4
42	08/15/03	68.8	77.9	3.2	3.4
42	08/15/03	90.0	71.7	3.2	3.4
42	08/15/03	62.7	86.1	3.2	3.4
42	08/15/03	81.0	62.5	3.2	3.4
42	08/15/03	82.1	55.8	3.2	3.4
42	08/15/03	74.8	64.7	3.2	3.4
42	08/15/03	68.2	73.6	3.2	3.4
42	08/15/03	85.8	66.7	3.2	3.4
42	08/15/03	67.5	81.1	3.2	3.4
42	08/15/03	70.3	95.2	3.2	3.4
42	08/15/03	84.3	89.1	3.2	3.4
42	08/15/03	78.3	69.0	3.2	3.4
42	08/15/03	75.3	81.5	3.2	3.4
42	08/15/03	77.6	71.0	3.2	3.4
42	08/15/03	85.6	77.4	3.2	3.4
42	08/15/03	72.6	76.2	3.2	3.4
42	08/15/03	78.2	72.9	3.2	3.4
42	08/15/03	76.4	76.6	3.2	3.4
42	08/15/03	81.6	71.0	3.2	3.4
42	08/15/03	82.9	100.7	3.2	3.4
42	08/15/03	86.7	74.5	3.2	3.4
42	08/15/03	81.9	70.8	3.2	3.4
42	08/15/03	71.2	73.5	3.2	3.4
42	08/15/03	83.4	71.9	3.2	3.4
42	08/15/03	63.0	83.6	3.2	3.4
42	08/15/03	69.2	66.6	3.2	3.4
42	08/15/03	91.7	96.8	3.2	3.4
42	08/15/03	77.5	82.1	3.2	3.4
42	08/15/03	70.4	73.7	3.2	3.4
42	08/15/03	72.7	78.6	3.2	3.4
42	08/15/03	55.4	80.1	3.2	3.4
42	08/15/03	71.4	74.1	3.2	3.4
42	08/15/03	71.3	79.1	3.2	3.4
42	08/15/03	74.6	77.9	3.2	3.4
42	08/15/03	95.4	97.3	3.2	3.4
42	08/15/03	90.9	99.3	3.2	3.4
42	08/15/03	102.0	73.2	3.2	3.4

21	07/15/03	32.6	45.9	1.3	3.1
21	07/15/03	52.1	66.0	1.3	3.1
21	07/15/03	43.0	81.8	1.3	3.1
21	07/15/03	52.4	65.4	1.3	3.1
21	07/15/03	38.5	89.9	1.3	3.1
21	07/15/03	36.2	84.2	1.3	3.1
35,13	07/17/03	54.2	82.8	1.5	2.9
35,13	07/17/03	56.1	70.0	1.5	2.9
35,13	07/17/03	57.0	77.8	1.5	2.9
35,13	07/17/03	56.9	52.8	1.5	2.9
35,13	07/17/03	35.6	81.1	1.5	2.9
35,13	07/17/03	57.4	70.9	1.5	2.9
35,13	07/17/03	56.2	60.2	1.5	2.9
35,13	07/17/03	38.5	85.5	1.5	2.9
35,13	07/17/03	57.0	66.6	1.5	2.9
35,13	07/17/03	55.0	82.3	1.5	2.9
35,13	07/17/03	48.6	73.0	1.5	2.9
35,13	07/17/03	52.8	60.2	1.5	2.9
35,13	07/17/03	52.2	78.2	1.5	2.9
35,13	07/17/03	53.0	90.8	1.5	2.9
35,13	07/17/03	58.1	69.0	1.5	2.9
35,13	07/17/03	55.6	55.8	1.5	2.9
35,13	07/17/03	53.3	80.5	1.5	2.9
35,13	07/17/03	57.0	88.5	1.5	2.9
35,13	07/17/03	57.3	64.7	1.5	2.9
35,13	07/17/03	41.9	62.8	1.5	2.9
35,13	07/17/03	37.8	78.0	1.5	2.9
35,13	07/17/03	55.4	71.9	1.5	2.9
35,13	07/17/03	51.4	57.8	1.5	2.9
35,13	07/17/03	53.8	81.4	1.5	2.9
35,13	07/17/03	55.8	77.6	1.5	2.9
35,13	07/17/03	54.0	70.8	1.5	2.9
35,13	07/17/03	47.0	79.7	1.5	2.9
35,13	07/17/03	56.0	64.0	1.5	2.9
35,13	07/17/03	52.1	73.8	1.5	2.9
35,13	07/17/03	54.3	67.7	1.5	2.9
35,13	07/17/03	56.9	73.9	1.5	2.9
35,13	07/17/03	56.1	84.3	1.5	2.9
35,13	07/17/03	61.9	71.8	1.5	2.9
35,13	07/17/03	56.7	58.5	1.5	2.9
35,13	07/17/03	35.4	95.5	1.5	2.9
35,13	07/17/03	34.2	78.1	1.5	2.9
35,13	07/17/03	49.3	78.0	1.5	2.9
35,13	07/17/03	52.4	85.9	1.5	2.9
35,13	07/17/03	56.3	78.4	1.5	2.9
35,13	07/17/03	37.8	75.0	1.5	2.9
35,13	07/17/03	47.7	74.4	1.5	2.9
35,13	07/17/03	41.6	55.5	1.5	2.9
35,13	07/17/03	56.5	73.7	1.5	2.9
35,13	07/17/03	59.9	59.9	1.5	2.9
35,13	07/17/03	58.7	70.8	1.5	2.9
35,13	07/17/03	49.6	98.9	1.5	2.9
35,13	07/17/03	58.1	78.8	1.5	2.9
35,13	07/17/03	53.4	70.0	1.5	2.9

42	08/15/03	89.1	78.3	3.2	3.4
42	08/15/03	68.7	72.7	3.2	3.4
42	08/15/03	81.0	79.8	3.2	3.4
42	08/15/03	87.4	67.9	3.2	3.4
42	08/15/03	81.3	71.8	3.2	3.4
42	08/15/03	99.5	69.6	3.2	3.4
36	08/16/03	86.9	87.3	3.0	4.3
36	08/16/03	88.4	76.0	3.0	4.3
36	08/16/03	84.2	106.5	3.0	4.3
36	08/16/03	91.1	91.1	3.0	4.3
36	08/16/03	79.3	97.6	3.0	4.3
36	08/16/03	84.8	75.9	3.0	4.3
36	08/16/03	94.5	95.0	3.0	4.3
36	08/16/03	99.7	87.4	3.0	4.3
36	08/16/03	95.9	80.7	3.0	4.3
36	08/16/03	86.5	89.5	3.0	4.3
36	08/16/03	90.8	80.9	3.0	4.3
36	08/16/03	77.8	76.6	3.0	4.3
36	08/16/03	96.4	84.3	3.0	4.3
36	08/16/03	94.6	97.0	3.0	4.3
36	08/16/03	88.4	99.0	3.0	4.3
36	08/16/03	88.3	96.3	3.0	4.3
36	08/16/03	70.2	84.9	3.0	4.3
36	08/16/03	83.8	82.3	3.0	4.3
36	08/16/03	82.8	84.9	3.0	4.3
36	08/16/03	82.5	87.3	3.0	4.3
36	08/16/03	87.1	98.5	3.0	4.3
36	08/16/03	85.4	80.4	3.0	4.3
36	08/16/03	73.6	72.1	3.0	4.3
36	08/16/03	68.6	88.7	3.0	4.3
36	08/16/03	69.6	98.5	3.0	4.3
36	08/16/03	72.9	93.0	3.0	4.3
36	08/16/03	82.7	63.7	3.0	4.3
36	08/16/03	80.7	90.2	3.0	4.3
36	08/16/03	76.5	103.9	3.0	4.3
36	08/16/03	78.4	91.9	3.0	4.3
36	08/16/03	83.6	114.7	3.0	4.3
36	08/16/03	85.5	87.4	3.0	4.3
36	08/16/03	63.8	108.9	3.0	4.3
36	08/16/03	82.7	82.9	3.0	4.3
36	08/16/03	85.6	108.1	3.0	4.3
36	08/16/03	78.2	72.0	3.0	4.3
36	08/16/03	94.3	105.1	3.0	4.3
36	08/16/03	68.2	110.8	3.0	4.3
36	08/16/03	86.3	105.3	3.0	4.3
36	08/16/03	82.8	90.1	3.0	4.3
36	08/16/03	77.5	86.8	3.0	4.3
36	08/16/03	86.0	73.8	3.0	4.3
36	08/16/03	93.0	87.7	3.0	4.3
36	08/16/03	77.0	88.6	3.0	4.3
36	08/16/03	78.6	89.2	3.0	4.3
36	08/16/03	84.9	91.0	3.0	4.3
36	08/16/03	81.4	94.0	3.0	4.3
36	08/16/03	84.3	82.2	3.0	4.3

35,13	07/17/03	43.7	74.7	1.5	2.9
35,13	07/17/03	53.5	66.7	1.5	2.9
55,50,51	07/25/03	74.6	97.3	3.0	4.3
55,50,51	07/25/03	80.6	92.0	3.0	4.3
55,50,51	07/25/03	68.1	94.5	3.0	4.3
55,50,51	07/25/03	81.6	97.9	3.0	4.3
55,50,51	07/25/03	78.9	92.6	3.0	4.3
55,50,51	07/25/03	61.0	92.3	3.0	4.3
55,50,51	07/25/03	70.7	98.4	3.0	4.3
55,50,51	07/25/03	73.2	98.4	3.0	4.3
55,50,51	07/25/03	75.8	92.5	3.0	4.3
55,50,51	07/25/03	72.5	97.9	3.0	4.3
55,50,51	07/25/03	65.4	105.3	3.0	4.3
55,50,51	07/25/03	67.0	98.8	3.0	4.3
55,50,51	07/25/03	56.6	99.9	3.0	4.3
55,50,51	07/25/03	68.0	94.2	3.0	4.3
55,50,51	07/25/03	59.6	60.0	3.0	4.3
55,50,51	07/25/03	60.1	95.2	3.0	4.3
55,50,51	07/25/03	80.2	101.7	3.0	4.3
55,50,51	07/25/03	75.0	95.6	3.0	4.3
55,50,51	07/25/03	68.8	87.7	3.0	4.3
55,50,51	07/25/03	75.1	85.2	3.0	4.3
55,50,51	07/25/03	95.3	96.4	3.0	4.3
55,50,51	07/25/03	74.3	87.8	3.0	4.3
55,50,51	07/25/03	68.2	99.1	3.0	4.3
55,50,51	07/25/03	72.7	95.6	3.0	4.3
55,50,51	07/25/03	78.6	93.7	3.0	4.3
55,50,51	07/25/03	71.7	94.9	3.0	4.3
55,50,51	07/25/03	69.0	93.5	3.0	4.3
55,50,51	07/25/03	68.6	79.3	3.0	4.3
55,50,51	07/25/03	92.5	92.3	3.0	4.3
55,50,51	07/25/03	73.6	64.3	3.0	4.3
55,50,51	07/25/03	87.6	119.1	3.0	4.3
55,50,51	07/25/03	79.7	79.2	3.0	4.3
55,50,51	07/25/03	68.3	78.5	3.0	4.3
55,50,51	07/25/03	70.7	72.6	3.0	4.3
55,50,51	07/25/03	73.9	98.5	3.0	4.3
55,50,51	07/25/03	71.2	93.1	3.0	4.3
55,50,51	07/25/03	63.2	78.6	3.0	4.3
55,50,51	07/25/03	62.9	91.4	3.0	4.3
55,50,51	07/25/03	81.8	92.5	3.0	4.3
55,50,51	07/25/03	69.7	91.9	3.0	4.3
55,50,51	07/25/03	77.7	78.1	3.0	4.3
55,50,51	07/25/03	67.3	83.6	3.0	4.3
55,50,51	07/25/03	79.7	79.0	3.0	4.3
55,50,51	07/25/03	67.5	95.3	3.0	4.3
55,50,51	07/25/03	72.1	85.7	3.0	4.3
55,50,51	07/25/03	74.6	90.9	3.0	4.3
55,50,51	07/25/03	82.3	87.9	3.0	4.3
55,50,51	07/25/03	87.0	93.8	3.0	4.3
55,50,51	07/25/03	71.3	90.4	3.0	4.3
55,50,51	07/25/03	88.1	91.3	3.0	4.3
54	07/26/03	78.8	110.6	3.4	6.0
54	07/26/03	78.2	112.0	3.4	6.0

36	08/16/03	85.4	84.0	3.0	4.3
36	08/16/03	67.8	84.0	3.0	4.3
36	08/18/03	119.4	89.1	4.3	4.8
36	08/18/03	100.6	78.3	4.3	4.8
36	08/18/03	57.7	95.1	4.3	4.8
36	08/18/03	102.4	92.1	4.3	4.8
36	08/18/03	109.5	92.5	4.3	4.8
36	08/18/03	95.7	95.7	4.3	4.8
36	08/18/03	94.6	99.6	4.3	4.8
36	08/18/03	73.2	86.1	4.3	4.8
36	08/18/03	107.9	93.7	4.3	4.8
36	08/18/03	83.6	96.3	4.3	4.8
36	08/18/03	102.6	88.8	4.3	4.8
36	08/18/03	116.3	98.8	4.3	4.8
36	08/18/03	112.1	94.3	4.3	4.8
36	08/18/03	108.6	105.2	4.3	4.8
36	08/18/03	115.1	102.2	4.3	4.8
36	08/18/03	91.7	89.9	4.3	4.8
36	08/18/03	89.4	103.3	4.3	4.8
36	08/18/03	78.7	102.3	4.3	4.8
36	08/18/03	120.8	95.6	4.3	4.8
36	08/18/03	103.7	107.4	4.3	4.8
36	08/18/03	101.2	82.3	4.3	4.8
36	08/18/03	102.9	84.6	4.3	4.8
36	08/18/03	99.7	103.8	4.3	4.8
36	08/18/03	94.6	105.6	4.3	4.8
36	08/18/03	90.6	94.0	4.3	4.8
36	08/18/03	92.5	95.0	4.3	4.8
36	08/18/03	98.9	74.8	4.3	4.8
36	08/18/03	99.1	84.4	4.3	4.8
36	08/18/03	105.7	81.4	4.3	4.8
36	08/18/03	70.7	79.0	4.3	4.8
36	08/18/03	95.5	97.5	4.3	4.8
36	08/18/03	96.2	87.1	4.3	4.8
36	08/18/03	96.0	64.3	4.3	4.8
36	08/18/03	97.7	98.5	4.3	4.8
36	08/18/03	97.6	103.5	4.3	4.8
36	08/18/03	97.1	70.4	4.3	4.8
36	08/18/03	101.8	101.1	4.3	4.8
36	08/18/03	98.6	86.2	4.3	4.8
36	08/18/03	85.6	103.9	4.3	4.8
36	08/18/03	97.8	105.0	4.3	4.8
36	08/18/03	93.3	76.5	4.3	4.8
36	08/18/03	102.9	108.2	4.3	4.8
36	08/18/03	93.5	93.5	4.3	4.8
36	08/18/03	88.1	91.0	4.3	4.8
36	08/18/03	83.7	81.4	4.3	4.8
36	08/18/03	96.4	81.2	4.3	4.8
36	08/18/03	92.8	91.0	4.3	4.8
36	08/18/03	99.8	90.0	4.3	4.8
36	08/18/03	84.6	89.0	4.3	4.8
36	08/18/03	108.0	99.1	4.3	4.8
37	08/19/03	92.6	90.3	4.8	4.0
37	08/19/03	98.3	105.9	4.8	4.0

54	07/26/03	65.1	90.4	3.4	6.0
54	07/26/03	74.8	99.0	3.4	6.0
54	07/26/03	79.4	96.8	3.4	6.0
54	07/26/03	78.9	95.0	3.4	6.0
54	07/26/03	74.8	95.8	3.4	6.0
54	07/26/03	73.4	77.8	3.4	6.0
54	07/26/03	75.8	100.7	3.4	6.0
54	07/26/03	76.8	119.5	3.4	6.0
54	07/26/03	81.5	110.2	3.4	6.0
54	07/26/03	82.8	97.8	3.4	6.0
54	07/26/03	78.1	106.8	3.4	6.0
54	07/26/03	82.1	106.9	3.4	6.0
54	07/26/03	68.6	107.8	3.4	6.0
54	07/26/03	78.1	90.8	3.4	6.0
54	07/26/03	85.3	114.2	3.4	6.0
54	07/26/03	86.1	100.4	3.4	6.0
54	07/26/03	78.0	110.4	3.4	6.0
54	07/26/03	73.2	93.4	3.4	6.0
54	07/26/03	77.8	108.9	3.4	6.0
54	07/26/03	74.2	88.5	3.4	6.0
54	07/26/03	72.4	118.8	3.4	6.0
54	07/26/03	77.4	92.7	3.4	6.0
54	07/26/03	75.4	106.8	3.4	6.0
54	07/26/03	77.7	102.9	3.4	6.0
54	07/26/03	73.0	102.5	3.4	6.0
54	07/26/03	73.5	102.8	3.4	6.0
54	07/26/03	74.6	109.3	3.4	6.0
54	07/26/03	77.2	110.8	3.4	6.0
54	07/26/03	84.8	99.8	3.4	6.0
54	07/26/03	76.4	105.0	3.4	6.0
54	07/26/03	78.6	77.0	3.4	6.0
54	07/26/03	73.8	107.6	3.4	6.0
54	07/26/03	78.5	109.7	3.4	6.0
54	07/26/03	76.4	100.8	3.4	6.0
54	07/26/03	79.2	107.0	3.4	6.0
54	07/26/03	87.1	102.1	3.4	6.0
54	07/26/03	80.7	107.7	3.4	6.0
54	07/26/03	75.3	104.4	3.4	6.0
54	07/26/03	83.8	100.3	3.4	6.0
54	07/26/03	76.2	103.6	3.4	6.0
54	07/26/03	72.0	110.9	3.4	6.0
54	07/26/03	76.8	104.6	3.4	6.0
54	07/26/03	75.5	106.6	3.4	6.0
54	07/26/03	85.4	98.2	3.4	6.0
54	07/26/03	73.2	108.7	3.4	6.0
54	07/26/03	72.5	107.6	3.4	6.0
54	07/26/03	63.9	107.8	3.4	6.0
54	07/26/03	73.7	97.6	3.4	6.0
56,52	07/27/03	59.2	76.0	2.1	3.7
56,52	07/27/03	52.2	68.2	2.1	3.7
56,52	07/27/03	23.7	72.3	2.1	3.7
56,52	07/27/03	47.6	68.7	2.1	3.7
56,52	07/27/03	57.6	79.0	2.1	3.7
56,52	07/27/03	51.3	85.6	2.1	3.7

37	08/19/03	97.3	126.2	4.8	4.0
37	08/19/03	120.9	73.6	4.8	4.0
37	08/19/03	125.5	108.8	4.8	4.0
37	08/19/03	112.7	113.7	4.8	4.0
37	08/19/03	80.2	119.4	4.8	4.0
37	08/19/03	126.5	113.3	4.8	4.0
37	08/19/03	125.7	114.9	4.8	4.0
37	08/19/03	104.9	104.2	4.8	4.0
37	08/19/03	118.6	84.1	4.8	4.0
37	08/19/03	125.1	82.1	4.8	4.0
37	08/19/03	100.2	102.5	4.8	4.0
37	08/19/03	105.5	106.1	4.8	4.0
37	08/19/03	94.9	78.0	4.8	4.0
37	08/19/03	92.0	110.5	4.8	4.0
37	08/19/03	90.1	101.7	4.8	4.0
37	08/19/03	67.9	103.3	4.8	4.0
37	08/19/03	125.8	77.9	4.8	4.0
37	08/19/03	100.1	89.1	4.8	4.0
37	08/19/03	93.9	101.4	4.8	4.0
37	08/19/03	125.9	118.7	4.8	4.0
37	08/19/03	121.8	96.5	4.8	4.0
37	08/19/03	125.3	100.8	4.8	4.0
37	08/19/03	121.8	66.7	4.8	4.0
37	08/19/03	89.0	76.2	4.8	4.0
37	08/19/03	127.1	95.3	4.8	4.0
37	08/19/03	126.1	105.1	4.8	4.0
37	08/19/03	128.8	102.4	4.8	4.0
37	08/19/03	127.0	82.7	4.8	4.0
37	08/19/03	129.0	83.9	4.8	4.0
37	08/19/03	90.4	100.9	4.8	4.0
37	08/19/03	129.6	96.7	4.8	4.0
37	08/19/03	100.8	92.1	4.8	4.0
37	08/19/03	109.3	110.6	4.8	4.0
37	08/19/03	106.4	87.2	4.8	4.0
37	08/19/03	143.2	131.7	4.8	4.0
37	08/19/03	124.4	128.7	4.8	4.0
37	08/19/03	99.3	106.5	4.8	4.0
37	08/19/03	99.5	126.9	4.8	4.0
37	08/19/03	126.6	110.4	4.8	4.0
37	08/19/03	89.9	125.9	4.8	4.0
37	08/19/03	110.0	82.7	4.8	4.0
37	08/19/03	131.2	121.0	4.8	4.0
37	08/19/03	129.1	76.8	4.8	4.0
37	08/19/03	125.6	97.9	4.8	4.0
37	08/19/03	132.2	115.6	4.8	4.0
37	08/19/03	100.9	87.1	4.8	4.0
37	08/19/03	119.5	116.7	4.8	4.0
37	08/19/03	125.2	115.8	4.8	4.0
38	08/20/03	107.4	131.6	4.6	4.5
38	08/20/03	88.5	124.6	4.6	4.5
38	08/20/03	124.6	119.0	4.6	4.5
38	08/20/03	121.1	115.1	4.6	4.5
38	08/20/03	117.8	119.4	4.6	4.5
38	08/20/03	96.2	116.6	4.6	4.5

56.52	07/27/03	67.4	70.6	2.1	3.7
56.52	07/27/03	56.1	83.7	2.1	3.7
56.52	07/27/03	59.0	62.0	2.1	3.7
56.52	07/27/03	67.0	78.4	2.1	3.7
56.52	07/27/03	64.2	79.1	2.1	3.7
56.52	07/27/03	55.1	63.7	2.1	3.7
56.52	07/27/03	43.4	76.5	2.1	3.7
56.52	07/27/03	53.9	87.8	2.1	3.7
56.52	07/27/03	72.4	99.4	2.1	3.7
56.52	07/27/03	62.7	77.1	2.1	3.7
56.52	07/27/03	50.7	81.5	2.1	3.7
56.52	07/27/03	56.3	79.0	2.1	3.7
56.52	07/27/03	63.8	79.3	2.1	3.7
56.52	07/27/03	50.4	95.3	2.1	3.7
56.52	07/27/03	67.2	65.0	2.1	3.7
56.52	07/27/03	72.4	82.4	2.1	3.7
56.52	07/27/03	63.8	86.3	2.1	3.7
56.52	07/27/03	64.3	62.8	2.1	3.7
56.52	07/27/03	66.3	95.5	2.1	3.7
56.52	07/27/03	58.6	86.2	2.1	3.7
56.52	07/27/03	57.7	81.9	2.1	3.7
56.52	07/27/03	69.9	106.1	2.1	3.7
56.52	07/27/03	43.6	89.6	2.1	3.7
56.52	07/27/03	63.9	92.5	2.1	3.7
56.52	07/27/03	74.3	108.4	2.1	3.7
56.52	07/27/03	70.8	84.0	2.1	3.7
56.52	07/27/03	59.9	98.9	2.1	3.7
56.52	07/27/03	49.4	95.7	2.1	3.7
56.52	07/27/03	51.5	101.9	2.1	3.7
56.52	07/27/03	57.3	94.8	2.1	3.7
56.52	07/27/03	76.9	56.3	2.1	3.7
56.52	07/27/03	71.7	95.3	2.1	3.7
56.52	07/27/03	50.4	84.7	2.1	3.7
56.52	07/27/03	67.3	82.6	2.1	3.7
56.52	07/27/03	65.6	49.6	2.1	3.7
56.52	07/27/03	71.8	73.0	2.1	3.7
56.52	07/27/03	57.1	56.7	2.1	3.7
56.52	07/27/03	56.0	83.0	2.1	3.7
56.52	07/27/03	70.3	82.4	2.1	3.7
56.52	07/27/03	76.7	70.0	2.1	3.7
56.52	07/27/03	56.6	73.4	2.1	3.7
56.52	07/27/03	63.7	84.0	2.1	3.7
56.52	07/27/03	60.5	82.8	2.1	3.7
56.52	07/27/03	43.4	78.2	2.1	3.7
53	07/28/03	72.8	77.8	3.0	4.5
53	07/28/03	67.3	75.9	3.0	4.5
53	07/28/03	70.3	74.4	3.0	4.5
53	07/28/03	54.7	75.7	3.0	4.5
53	07/28/03	65.6	68.6	3.0	4.5
53	07/28/03	72.2	82.0	3.0	4.5
53	07/28/03	79.0	88.8	3.0	4.5
53	07/28/03	69.5	86.9	3.0	4.5
53	07/28/03	65.0	91.5	3.0	4.5
53	07/28/03	70.2	93.2	3.0	4.5

38	08/20/03	95.1	124.4	4.6	4.5
38	08/20/03	129.5	104.3	4.6	4.5
38	08/20/03	86.6	110.7	4.6	4.5
38	08/20/03	139.1	77.6	4.6	4.5
38	08/20/03	127.3	109.0	4.6	4.5
38	08/20/03	100.6	111.3	4.6	4.5
38	08/20/03	75.8	90.5	4.6	4.5
38	08/20/03	91.5	119.6	4.6	4.5
38	08/20/03	105.0	120.3	4.6	4.5
38	08/20/03	106.4	117.9	4.6	4.5
38	08/20/03	92.1	93.6	4.6	4.5
38	08/20/03	98.7	89.1	4.6	4.5
38	08/20/03	81.9	113.3	4.6	4.5
38	08/20/03	80.7	126.1	4.6	4.5
38	08/20/03	97.3	98.0	4.6	4.5
38	08/20/03	81.8	98.9	4.6	4.5
38	08/20/03	96.7	92.8	4.6	4.5
38	08/20/03	89.9	95.8	4.6	4.5
38	08/20/03	134.0	52.5	4.6	4.5
38	08/20/03	130.7	87.5	4.6	4.5
38	08/20/03	134.5	93.9	4.6	4.5
38	08/20/03	109.6	85.4	4.6	4.5
38	08/20/03	82.2	92.4	4.6	4.5
38	08/20/03	92.1	83.6	4.6	4.5
38	08/20/03	95.6	58.5	4.6	4.5
38	08/20/03	93.8	122.1	4.6	4.5
38	08/20/03	83.0	84.9	4.6	4.5
38	08/20/03	94.3	104.6	4.6	4.5
38	08/20/03	72.3	42.2	4.6	4.5
38	08/20/03	86.3	54.7	4.6	4.5
38	08/20/03	77.7	43.5	4.6	4.5
38	08/20/03	112.9	50.1	4.6	4.5
38	08/20/03	104.5	57.1	4.6	4.5
38	08/20/03	112.4	61.9	4.6	4.5
38	08/20/03	119.2	95.5	4.6	4.5
38	08/20/03	69.9	55.3	4.6	4.5
38	08/20/03	98.1	55.4	4.6	4.5
38	08/20/03	91.6	95.0	4.6	4.5
38	08/20/03	95.4	101.5	4.6	4.5
38	08/20/03	126.2	109.1	4.6	4.5
38	08/20/03	123.7	122.0	4.6	4.5
38	08/20/03	104.4	77.6	4.6	4.5
38	08/20/03	111.0	108.3	4.6	4.5
38	08/20/03	111.6	114.5	4.6	4.5
41,43	08/21/03	65.0	94.9	2.4	3.5
41,43	08/21/03	73.1	99.4	2.4	3.5
41,43	08/21/03	82.7	96.9	2.4	3.5
41,43	08/21/03	86.3	70.8	2.4	3.5
41,43	08/21/03	74.9	79.2	2.4	3.5
41,43	08/21/03	62.6	69.9	2.4	3.5
41,43	08/21/03	67.7	86.5	2.4	3.5
41,43	08/21/03	85.0	88.4	2.4	3.5
41,43	08/21/03	90.0	88.0	2.4	3.5
41,43	08/21/03	68.4	82.7	2.4	3.5

53	07/28/03	68.9	79.5	3.0	4.5
53	07/28/03	59.4	72.7	3.0	4.5
53	07/28/03	62.3	85.2	3.0	4.5
53	07/28/03	74.0	77.6	3.0	4.5
53	07/28/03	67.3	73.0	3.0	4.5
53	07/28/03	66.7	84.4	3.0	4.5
53	07/28/03	54.2	85.0	3.0	4.5
53	07/28/03	70.7	84.2	3.0	4.5
53	07/28/03	74.7	81.5	3.0	4.5
53	07/28/03	68.2	86.6	3.0	4.5
53	07/28/03	60.9	78.9	3.0	4.5
53	07/28/03	51.2	82.6	3.0	4.5
53	07/28/03	44.8	84.7	3.0	4.5
53	07/28/03	70.0	83.3	3.0	4.5
53	07/28/03	63.3	83.4	3.0	4.5
53	07/28/03	68.1	86.7	3.0	4.5
53	07/28/03	67.8	87.3	3.0	4.5
53	07/28/03	74.1	95.2	3.0	4.5
53	07/28/03	57.0	82.5	3.0	4.5
53	07/28/03	72.4	63.9	3.0	4.5
53	07/28/03	66.3	81.6	3.0	4.5
53	07/28/03	68.0	87.2	3.0	4.5
53	07/28/03	69.4	81.8	3.0	4.5
53	07/28/03	72.1	87.2	3.0	4.5
53	07/28/03	60.4	83.8	3.0	4.5
53	07/28/03	63.4	88.7	3.0	4.5
53	07/28/03	82.6	70.6	3.0	4.5
53	07/28/03	74.3	82.3	3.0	4.5
53	07/28/03	64.2	80.4	3.0	4.5
53	07/28/03	62.1	88.8	3.0	4.5
53	07/28/03	70.4	62.5	3.0	4.5
53	07/28/03	73.5	77.0	3.0	4.5
53	07/28/03	67.1	87.0	3.0	4.5
53	07/28/03	68.5	88.1	3.0	4.5
53	07/28/03	69.6	79.2	3.0	4.5
53	07/28/03	67.1	90.1	3.0	4.5
53	07/28/03	70.5	71.7	3.0	4.5
53	07/28/03	69.0	89.2	3.0	4.5
53	07/28/03	78.8	82.4	3.0	4.5
53	07/28/03	68.1	89.2	3.0	4.5
52	07/29/03	82.6	109.3	3.1	5.1
52	07/29/03	88.3	110.9	3.1	5.1
52	07/29/03	80.0	98.6	3.1	5.1
52	07/29/03	79.4	109.5	3.1	5.1
52	07/29/03	63.6	110.3	3.1	5.1
52	07/29/03	89.0	111.7	3.1	5.1
52	07/29/03	80.7	107.7	3.1	5.1
52	07/29/03	83.0	110.0	3.1	5.1
52	07/29/03	84.5	104.8	3.1	5.1
52	07/29/03	72.3	89.6	3.1	5.1
52	07/29/03	78.1	79.4	3.1	5.1
52	07/29/03	89.1	110.4	3.1	5.1
52	07/29/03	68.8	105.8	3.1	5.1
52	07/29/03	65.2	111.2	3.1	5.1

41,43	08/21/03	82.6	92.2	2.4	3.5
41,43	08/21/03	85.4	99.8	2.4	3.5
41,43	08/21/03	86.1	95.3	2.4	3.5
41,43	08/21/03	53.1	95.5	2.4	3.5
41,43	08/21/03	85.0	90.7	2.4	3.5
41,43	08/21/03	92.5	95.1	2.4	3.5
41,43	08/21/03	70.9	79.5	2.4	3.5
41,43	08/21/03	67.2	90.1	2.4	3.5
41,43	08/21/03	63.4	85.1	2.4	3.5
41,43	08/21/03	48.4	83.7	2.4	3.5
41,43	08/21/03	70.1	82.1	2.4	3.5
41,43	08/21/03	83.1	78.9	2.4	3.5
41,43	08/21/03	91.4	94.8	2.4	3.5
41,43	08/21/03	99.8	88.6	2.4	3.5
41,43	08/21/03	68.2	85.8	2.4	3.5
41,43	08/21/03	68.3	86.9	2.4	3.5
41,43	08/21/03	85.9	90.3	2.4	3.5
41,43	08/21/03	86.6	99.8	2.4	3.5
41,43	08/21/03	82.6	104.1	2.4	3.5
41,43	08/21/03	95.3	90.1	2.4	3.5
41,43	08/21/03	94.4	49.4	2.4	3.5
41,43	08/21/03	71.9	61.9	2.4	3.5
41,43	08/21/03	79.6	94.6	2.4	3.5
41,43	08/21/03	83.5	84.2	2.4	3.5
41,43	08/21/03	70.4	94.0	2.4	3.5
41,43	08/21/03	93.6	103.8	2.4	3.5
41,43	08/21/03	69.6	96.4	2.4	3.5
41,43	08/21/03	77.7	75.2	2.4	3.5
41,43	08/21/03	87.5	93.6	2.4	3.5
41,43	08/21/03	88.2	97.0	2.4	3.5
41,43	08/21/03	63.2	89.5	2.4	3.5
41,43	08/21/03	74.7	98.2	2.4	3.5
41,43	08/21/03	65.0	82.0	2.4	3.5
41,43	08/21/03	68.9	63.7	2.4	3.5
41,43	08/21/03	64.3	104.5	2.4	3.5
41,43	08/21/03	76.7	66.1	2.4	3.5
41,43	08/21/03	79.7	102.8	2.4	3.5
41,43	08/21/03	74.1	66.2	2.4	3.5
41,43	08/21/03	63.8	103.4	2.4	3.5
41,43	08/21/03	92.4	94.8	2.4	3.5
45,47	08/26/03	70.8	94.5	2.4	3.1
45,47	08/26/03	88.2	89.2	2.4	3.1
45,47	08/26/03	68.1	85.7	2.4	3.1
45,47	08/26/03	60.1	87.3	2.4	3.1
45,47	08/26/03	75.8	86.4	2.4	3.1
45,47	08/26/03	85.3	80.0	2.4	3.1
45,47	08/26/03	83.7	89.0	2.4	3.1
45,47	08/26/03	77.3	90.7	2.4	3.1
45,47	08/26/03	77.3	77.0	2.4	3.1
45,47	08/26/03	66.7	100.2	2.4	3.1
45,47	08/26/03	74.2	74.0	2.4	3.1
45,47	08/26/03	87.5	70.9	2.4	3.1
45,47	08/26/03	92.5	80.9	2.4	3.1
45,47	08/26/03	73.1	92.5	2.4	3.1

52	07/29/03	77.4	91.3	3.1	5.1
52	07/29/03	64.7	85.8	3.1	5.1
52	07/29/03	94.1	107.9	3.1	5.1
52	07/29/03	78.2	83.8	3.1	5.1
52	07/29/03	81.9	97.7	3.1	5.1
52	07/29/03	73.6	91.1	3.1	5.1
52	07/29/03	69.5	86.8	3.1	5.1
52	07/29/03	71.4	77.9	3.1	5.1
52	07/29/03	77.7	100.2	3.1	5.1
52	07/29/03	88.7	86.8	3.1	5.1
52	07/29/03	58.6	95.9	3.1	5.1
52	07/29/03	57.3	106.3	3.1	5.1
52	07/29/03	92.4	86.8	3.1	5.1
52	07/29/03	73.6	92.9	3.1	5.1
52	07/29/03	60.4	84.9	3.1	5.1
52	07/29/03	80.7	92.7	3.1	5.1
52	07/29/03	74.7	68.0	3.1	5.1
52	07/29/03	64.7	88.5	3.1	5.1
52	07/29/03	72.9	83.7	3.1	5.1
52	07/29/03	74.2	90.0	3.1	5.1
52	07/29/03	79.7	82.9	3.1	5.1
52	07/29/03	83.3	92.4	3.1	5.1
52	07/29/03	73.8	106.7	3.1	5.1
52	07/29/03	79.6	89.2	3.1	5.1
52	07/29/03	63.0	87.8	3.1	5.1
52	07/29/03	83.3	105.0	3.1	5.1
52	07/29/03	84.5	91.5	3.1	5.1
52	07/29/03	71.6	93.1	3.1	5.1
52	07/29/03	75.9	85.7	3.1	5.1
52	07/29/03	62.0	94.8	3.1	5.1
52	07/29/03	76.6	93.7	3.1	5.1
52	07/29/03	91.8	78.7	3.1	5.1
52	07/29/03	85.3	84.0	3.1	5.1
52	07/29/03	90.2	97.4	3.1	5.1
52	07/29/03	64.7	89.7	3.1	5.1
52	07/29/03	85.8	105.1	3.1	5.1

45,47	08/26/03	86.3	95.1	2.4	3.1
45,47	08/26/03	53.3	92.1	2.4	3.1
45,47	08/26/03	89.8	91.5	2.4	3.1
45,47	08/26/03	47.1	94.2	2.4	3.1
45,47	08/26/03	66.0	35.7	2.4	3.1
45,47	08/26/03	57.1	81.0	2.4	3.1
45,47	08/26/03	81.1	77.1	2.4	3.1
45,47	08/26/03	80.1	92.2	2.4	3.1
45,47	08/26/03	93.6	97.8	2.4	3.1
45,47	08/26/03	65.8	100.9	2.4	3.1
45,47	08/26/03	81.6	95.1	2.4	3.1
45,47	08/26/03	84.5	95.5	2.4	3.1
45,47	08/26/03	88.4	88.5	2.4	3.1
45,47	08/26/03	90.0	78.2	2.4	3.1
45,47	08/26/03	87.7	85.2	2.4	3.1
45,47	08/26/03	79.8	94.7	2.4	3.1
45,47	08/26/03	51.4	74.9	2.4	3.1
45,47	08/26/03	90.4	83.1	2.4	3.1
45,47	08/26/03	77.0	59.0	2.4	3.1
45,47	08/26/03	52.0	83.5	2.4	3.1
45,47	08/26/03	74.9	75.4	2.4	3.1
45,47	08/26/03	88.3	65.3	2.4	3.1
45,47	08/26/03	74.4	94.8	2.4	3.1
45,47	08/26/03	62.4	74.6	2.4	3.1
45,47	08/26/03	87.5	88.1	2.4	3.1
45,47	08/26/03	77.1	98.6	2.4	3.1
45,47	08/26/03	89.5	68.2	2.4	3.1
45,47	08/26/03	90.9	117.0	2.4	3.1
45,47	08/26/03	80.6	63.1	2.4	3.1
45,47	08/26/03	87.6	80.4	2.4	3.1
45,47	08/26/03	89.2	83.8	2.4	3.1
45,47	08/26/03	79.6	78.8	2.4	3.1
45,47	08/26/03	79.9	90.4	2.4	3.1
45,47	08/26/03	68.7	90.8	2.4	3.1
45,47	08/26/03	60.3	91.9	2.4	3.1
45,47	08/26/03	70.2	87.9	2.4	3.1

## APPENDIX C

### COMPONENT PERCENT MOISTURE CONTENT

These data show the percent moisture content of the various components collected each sample day. I randomly selected sample components from each tree and determined field and dry weights. Percent moisture content is recorded as a percent of the dry weight. PL represents the plot from which the sample trees (ST) come and DA represents the date the samples were collected. The following components are abbreviated as follows:

2003 needles	NE03.L
2002 needles	NE02.L
0-.25" live	<.25.L
.25-1" live	.25-1.L
1+ live	>1.L
0-.25" dead	<.25.D
.25-1" dead	.25-1.D
1"+ dead	>1.D
Cones dead	CO.D
Dead needles	NE.D
Cones live	CO.L

PL	DA	ST	NE03.L	NE02.L	<.25.L	.25-1.L	>1.L	<.25.D	.25-1.D	>1.D	CO.D	NE.D	CO.L
1	6/30/2003	27,4,8,31	216	112	89	87	na	15	15	na	na	100	na
1	7/1/2003	15,19	210	115	90	93	44	10	19	34	na	na	na
1	7/2/2003	1	172	100	66	82	43	9	9	40	7	na	308
1	7/3/2003	3	197	104	101	110	50	11	21	52	12	na	na
1	7/15/2003	21	171	107	70	79	44	12	18	20	12	na	na
1	7/17/2003	35,13	182	112	90	98	na	38	67	35	na	na	na
3	7/24/2003	55	na	na	na	na	na	75	41	na	na	na	na
3	7/25/2003	55,50,51	178	117	98	98	41	15	15	23	19	40	202
3	7/26/2003	54	163	109	81	73	49	13	na	18	12	74	159
3	7/27/2003	56,52	167	109	72	60	47	11	27	24	14	17	na
3	7/28/2003	53	172	122	82	87	48	10	12	17	9	na	172
3	7/29/2003	52	172	111	83	85	46	23	20	74	28	36	184
3	7/30/2003	49	178	113	84	92	46	18	21	na	32	26	na
2	8/7/2003	39	183	118	85	84	46	26	51	84	32	114	na
2	8/13/2003	46	164	120	78	93	44	34	57	28	42	na	na
2	8/14/2003	40,44	171	na	na	89	47	na	na	na	na	31	na
2	8/14/2003	40,42,44	na	120	93	na	na	20	28	74	21	na	na
2	8/15/2003	42	148	113	80	88	42	26	39	na	19	na	na
2	8/16/2003	36	164	113	83	84	51	17	35	22	15	na	na
2	8/18/2003	36	160	108	92	109	55	na	na	na	60	na	na
2	8/18/2003	36,37	na	na	na	na	na	46	na	na	na	na	na
2	8/18/2003	37	na	na	na	na	na	na	71	66	na	na	na
2	8/19/2003	37	154	108	77	76	36	21	32	96	30	na	na
2	8/20/2003	38	155	113	83	92	49	21	40	98	15	47	na
2	8/21/2003	41,43	152	111	75	73	na	18	23	28	21	na	na

## APPENDIX D

### LARGE LIVE BRANCH DATA

These data represent the weights of all the live branches greater than 0.6 cm (0.25 inches) in diameter from each sample tree. I abbreviated the parameters in the following way.

Sample tree	ST
Sample branch	SB
Height class of branch (m)	HT
Branch basal Diameter (cm)	DI
Branch length (m)	LE
Foliage Ratio	FR
Field weight (g)	FW
Subsample branch = *	S
Predicted total dry weight (g)	PT
Predicted foliage dry weight (g)	PF
Predicted < .25" branch dry weight (g)	PB

ST	SB	HT	DI	LE	FR	FW	S	PT	PF	PB
1	18	3.8	1.8	0.2	1810			502.1	89.5	289.0
1	29	2.3	1.8	0.3	590			189.0	45.0	91.7
1	39	4.0	2.4	0.4	2250			629.9	152.3	250.5
1	49	1.6	1.3	0.1	160			57.4	11.4	40.8
1	59	3.2	2.7	0.3	1190	*		352.0	77.5	169.4
1	610	1.8	1.5	0.4	360			124.0	36.8	50.4
1	710	2.2	1.8	0.5	530			177.7	59.5	59.8
1	810	3.3	2.5	0.7	1550			476.2	196.7	109.6
1	910	0.8	0.8	0.4	40			17.7	6.7	7.4
1	1010	1.3	1.3	0.4	110			43.3	14.7	17.8
1	1110	2.1	1.8	0.7	580			199.1	91.8	46.3
1	1210	1.3	1	0.4	80			32.7	11.5	13.5
1	1310	1.9	1.8	0.5	480			162.8	55.1	54.8
1	1410	3.1	2.5	0.6	1760			524.0	181.0	144.7
1	1510	3.6	2.3	0.7	1860	*		559.8	226.5	128.5
1	1611	1.1	0.8	0.3	70			28.5	8.6	14.2
1	1711	1.7	1.1	0.5	220			81.5	30.1	27.7
1	1811	3.2	2.1	0.5	1360			409.9	123.6	136.4
1	1911	2.1	1.4	0.6	550			186.8	73.4	52.3
1	2011	3.0	2	0.7	1120			357.0	152.9	82.4
1	2111	1.0	1	0.1	32.5			14.0	3.3	10.1
1	2211	0.9	0.9	0.4	52.5			22.5	8.3	9.3
1	2311	1.3	1	0.6	150			59.0	26.8	16.8
1	2411	1.4	1.2	0.4	180			67.1	21.5	27.4
1	2511	1.3	1	0.6	160	*		62.5	28.2	17.7
1	2611	1.7	1.3	0.7	330			120.8	59.3	28.3
1	2711	2.9	1.9	0.8	1370			434.1	214.3	83.2
1	2811	2.3	1.6	0.6	740			243.0	92.4	67.8
1	2911	1.6	1.3	0.7	290			107.7	53.6	25.3
1	3011	1.2	1	0.6	140			55.5	25.4	15.8
1	3111	3.2	2.1	0.8	1560			487.1	237.0	93.2
1	3211	2.8	2	0.7	1130			359.8	153.9	83.1
1	3311	2.4	1.8	0.7	750			250.1	112.0	58.0
1	3412	1.8	1.2	0.7	390			140.1	67.4	32.7
1	3512	2.3	1.5	0.7	800	*		264.9	117.8	61.4
1	3612	1.0	0.6	0.7	100			41.9	23.5	9.9
1	3712	1.6	1.1	0.7	310			114.3	56.4	26.8
1	3812	2.0	1.3	0.7	480			168.4	79.2	39.3
1	3912	1.8	1.3	0.7	400			143.2	68.8	33.5
1	4012	1.1	0.9	0.3	80			32.1	9.5	15.9
1	4112	1.9	1.4	0.8	490			174.4	96.5	33.8
1	4212	0.8	0.4	0.8	40			18.9	13.8	3.8
1	4312	1.0	1.7	0.4	50			21.5	8.0	8.9
1	4412	2.9	1.8	0.8	1210			388.8	194.6	74.7
1	4512	3.1	1.8	0.9	1320	*		427.2	249.7	68.2
1	4612	2.5	1.8	0.7	970			314.2	136.7	72.7
1	4712	1.4	1.9	0.3	130			49.4	13.9	24.4
1	4812	0.8	0.4	0.9	47.5			22.4	18.9	3.7
1	4912	0.7	0.4	0.8	26			12.9	9.9	2.6
1	5012	0.9	0.5	0.6	37.5			17.3	9.1	5.0
1	5112	0.7	0.4	0.7	18.5			9.4	6.3	2.3
1	5212	0.7	0.4	0.9	19			9.9	9.3	1.7
1	5312	0.7	0.3	0.8	40			18.9	13.8	3.8
1	5413	1.0	0.4	0.6	40			18.3	9.6	5.3
1	5513	2.1	1.3	0.8	560	*		196.3	107.1	38.0
1	5613	1.2	0.8	0.9	120			50.9	38.9	8.4
1	5713	1.2	0.6	0.7	98			41.1	23.1	9.8

ST	SB	HT	DI	LE	FR	FW	S	PT	PF	PB
38	7722	1.8	1.1	1	490			180.4	138.8	2
38	7822	1.5	0.8	1	270			106.3	87.4	1
38	7922	1.1	0.7	0.6	40			18.3	9.6	
38	8023	1.2	0.6	1	190	*		77.9	66.6	1
38	8123	1.3	0.5	1	190			77.9	66.6	1
38	8223	1.4	0.5	1	230			92.2	77.2	1
38	8323	1.4	0.6	1	290			113.3	92.4	1
38	8421	4.6	2	0.9	3970			1134.3	586.5	17
38	8521	3.6	1.95	0.8	2370			705.8	327.8	13
38	8621	2.7	1.65	0.5	1350			407.3	122.9	13
38	8721	3.3	1.45	0.6	1350			414.2	147.4	11
38	8821	0.9	0.7	0.2	90			35.1	8.7	2
38	8921	1.1	0.6	0.2	50			20.8	5.5	1
38	9021	1.3	1	0.4	160			60.4	19.6	2
38	9121	2.6	1.3	0.6	690			228.4	87.6	6
38	9221	2.8	1.5	0.7	1230			387.9	164.4	8
38	9321	1.6	1.2	0.8	400			145.7	82.5	2
38	9422	1.0	0.6	0.9	40			19.2	16.6	
38	9522	1.4	0.8	1	230			92.2	77.2	1
38	9622	0.9	0.7	0.6	60			26.2	13.2	
38	9722	0.7	0.4	0.2	11.5			5.7	1.8	
38	9823	1.2	0.6	1	200			81.5	69.3	1
38	9923	1.2	0.5	1	180			74.2	63.8	1
38	10023	1.6	0.7	1	320			123.6	99.8	1
38	10123	1.2	0.5	1	140			59.4	52.5	
38	10223	2.1	0.5	0.9	410			151.4	100.8	2
39	18	4.3	2.9	0.9	4160			1182.3	608.1	18
39	210	4.9	3.7	0.7	5580			1483.0	531.1	33
39	311	3.5	1.7	0.1	930			273.5	44.5	19
39	411	7.8	4	0.8	12425			3067.8	1184.9	57
39	512	5.0	2.2	0.7	3830	*		1062.2	396.7	20
39	613	3.9	2.7	0.7	3210			908.2	345.9	20
39	713	7.5	4.2	0.7	20380			4678.2	1450.5	100
39	814	3.3	2.4	0.5	1650			486.6	143.6	16
39	914	3.6	1.8	0.4	1310			389.9	100.1	15
39	1015	5.4	2.7	0.8	8220			2126.7	860.1	39
39	1115	2.8	2.2	0.8	1590			495.4	240.5	9
39	1215	3.0	1.9	0.7	1750			530.3	216.1	12
39	1315	4.1	2	0.7	2050			610.2	244.3	13
39	1416	7.1	4.2	0.8	12730			3134.5	1207.4	58
39	1516	6.4	3.3	0.8	10530	*		2649.1	1042.2	49
39	1616	4.9	1.1	0.5	1440			431.3	129.2	14
39	1717	0.8	0.3	0.7	78.5			33.8	19.5	
39	1818	3.2	1.8	0.8	2130			642.0	301.8	12
39	1918	1.3	0.7	0.6	110			44.8	21.1	1
39	2018	1.2	0.7	0.4	50			21.5	8.0	
39	2118	1.0	0.7	0.7	90			38.2	21.6	
39	2218	1.0	0.4	0.7	50			22.7	13.7	
39	2317	3.7	1.8	0.7	2530			735.4	287.6	16
39	2417	7.8	3.8	0.8	18735			4415.8	1629.4	82
39	2518	2.2	1.3	0.8	720	*		245.4	130.1	4
39	2618	3.6	2.1	0.8	2520			745.3	343.8	14
39	2719	3.7	2.2	0.7	2940			840.1	323.1	19
39	2819	3.3	1.8	0.8	2440			724.3	335.3	13
39	2919	4.1	1.8	0.7	2520			732.8	286.7	16
39	3019	2.1	2.3	0.8	780			263.4	138.5	5
39	3119	4.1	1.3	0.8	3510			999.9	444.5	18

1	5813	0.8	0.5	0.9	50	23.4	19.7	3.9
1	5913	2.0	1.3	0.9	520	187.0	121.2	30.2
1	6013	2.3	1.3	0.8	630	218.0	117.3	42.2
1	6113	2.0	1.2	0.9	430	158.0	104.6	25.5
1	6213	1.2	0.8	0.8	135	55.6	35.5	10.9
1	6313	0.9	0.6	0.7	46.5	21.2	13.0	5.1
1	6413	1.6	0.8	0.9	290	111.4	77.1	18.1
1	6513	0.7	0.2	0.9	17.5 *	9.2	8.7	1.5
1	6613	1.5	0.4	0.8	56.5	25.7	18.1	5.1
1	6713	2.1	1.3	0.9	520	187.0	121.2	30.2
1	6813	1.6	0.9	0.8	240	92.6	55.5	18.1
1	6913	0.9	0.4	0.6	34	15.8	8.5	4.6
1	7014	1.4	0.6	1	260	102.8	84.9	13.9
1	7114	0.8	0.4	1	46	22.1	22.2	3.1
1	7214	1.1	0.5	1	120	51.8	46.6	7.1
1	7314	0.9	0.5	0.9	70	31.6	25.6	5.2
1	7414	1.8	0.2	1	81	36.6	34.4	5.0
1	7514	2.1	0.8	1	440 *	164.0	127.7	22.1
1	7614	1.6	0.8	0.9	230	90.7	64.4	14.8
1	7714	1.4	0.8	0.8	210	82.3	50.0	16.1
1	7814	1.0	0.4	1	72.5	33.1	31.5	4.5
1	7914	0.9	0.5	0.9	87	38.3	30.3	6.3
1	8014	1.6	0.8	0.8	250	96.0	57.3	18.8
1	8114	1.3	0.8	0.9	180	73.0	53.2	11.9
1	8214	1.0	0.5	0.9	84.5	37.3	29.6	6.1
1	8314	1.6	0.9	0.8	230	89.2	53.7	17.5
1	8414	1.1	0.5	0.6	81	34.2	16.6	9.8
1	8514	1.0	0.5	1	97 *	42.9	39.5	5.9
1	8614	1.1	0.6	0.9	96.5	42.0	32.8	6.9
1	8714	0.9	0.4	0.8	61.5	27.7	19.3	5.5
1	8814	1.1	0.5	1	118	51.0	46.0	7.0
1	8914	1.3	0.7	0.9	143.5	59.7	44.7	9.8
1	9014	1.3	0.6	1	151	63.5	55.7	8.6
1	9114	1.3	0.6	1	145.5	61.5	54.1	8.4
1	9214	1.1	0.5	0.8	93	39.9	26.6	7.9
1	9314	0.7	0.3	0.8	20.5	10.4	8.2	2.1
3	18	3.2	2.5	0.4	1070	325.8	85.6	130.7
3	28	3.7	3.4	0.4	2470	684.2	163.7	271.8
3	38	4.2	3.5	0.7	3700	1030.2	386.2	234.7
3	49	2.9	2.8	0.6	1080	339.8	123.9	94.4
3	59	2.9	2.6	0.4	1280 *	382.0	98.3	152.9
3	69	3.1	2.6	0.6	1380	422.4	149.9	116.9
3	79	4.0	3.3	0.8	3210	923.7	414.8	175.4
3	810	3.4	2.5	0.8	2560	755.8	348.0	143.9
3	910	2.8	2	0.7	1210	382.3	162.3	88.2
3	1010	1.7	1.7	0.6	360	128.3	52.9	36.1
3	1110	1.6	1.4	0.7	460	162.1	76.7	37.8
3	1210	2.4	2.4	0.5	800	256.1	81.9	85.7
3	1310	2.9	2.6	0.7	1490	459.8	190.7	105.8
3	1410	2.5	2.3	0.7	1750	530.3	216.1	121.8
3	1510	2.8	2.4	0.7	1600 *	489.8	201.6	112.6
3	1610	3.0	2.7	0.7	1590	487.1	200.6	112.0
3	1710	3.1	2.7	0.8	2150	647.4	304.0	123.5
3	1810	3.2	2.7	0.8	1830	561.2	268.3	107.2
3	1911	3.1	1.9	0.8	1640	509.2	246.4	97.4
3	2011	3.4	2.2	0.9	2970	876.9	468.3	138.7
3	2111	1.1	1	0.7	150	60.0	32.1	14.2
3	2211	2.0	1.8	0.7	610	208.3	95.4	48.4

39	3219	1.6	0.9	0.5	160	61.4	23.5	2
39	3319	0.8	0.5	0.3	30	13.5	4.5	
39	3419	0.8	0.5	0.6	40	18.3	9.6	
39	3519	2.5	1.5	0.8	1280 *	408.7	203.3	7
39	3619	2.1	1.4	0.8	690	236.3	125.9	4
39	3719	1.9	1	0.8	520	183.8	101.1	3
39	3819	2.1	1.1	0.8	730	248.4	131.5	4
39	3920	2.9	1.6	0.7	310	114.3	56.4	2
39	4020	0.7	0.3	0.4	8	4.2	1.9	
39	4120	1.0	0.3	0.6	50	22.3	11.4	
39	4220	1.8	0.1	0.7	390	140.1	67.4	3
39	4320	1.8	0.9	0.8	390	142.4	80.9	2
39	4420	0.8	0.3	0.6	37.5	17.3	9.1	
39	4520	1.9	1.2	0.6	500 *	171.7	68.2	4
39	4620	0.8	0.5	0.7	80	34.4	19.7	
39	4720	1.9	1.1	0.7	680	229.3	103.8	5
39	4820	2.1	1.1	0.7	690	232.3	105.0	5
39	4920	2.3	1.3	0.7	930	302.7	132.3	7
39	5020	2.0	1	0.8	580	202.5	110.0	3
39	5120	2.1	1.3	0.8	870	290.2	150.7	5
39	5220	2.2	1.3	0.8	1030	337.1	171.8	6
39	5320	0.8	0.4	0.8	50.5	23.2	16.6	
39	5420	0.7	0.3	0.5	22	10.6	5.0	
39	5520	1.2	0.4	0.8	71.5 *	31.6	21.7	
39	5620	0.9	0.3	0.7	48.5	22.0	13.4	
39	5721	1.9	0.9	0.8	620	214.9	115.9	4
39	5821	1.5	0.7	0.7	280	104.4	52.2	2
39	5921	1.4	0.6	0.8	170	68.2	42.5	1
39	6021	2.1	1	0.8	690	236.3	125.9	4
39	6121	1.1	0.5	0.5	80	33.2	13.7	1
39	6221	1.0	0.5	0.7	90	38.2	21.6	
39	6321	1.4	0.7	0.6	230	86.2	37.3	2
39	6421	0.8	0.3	0.3	35.5	15.6	5.1	
39	6521	1.4	0.6	0.8	245.5 *	94.5	56.5	1
39	6621	1.1	0.4	0.9	127.5	53.7	40.7	
39	6721	0.7	0.3	0.8	35	16.8	12.5	
39	6821	0.8	0.4	0.8	67	29.9	20.6	
39	6921	1.6	0.4	1	164	68.3	59.4	
39	7021	2.1	1	0.8	780	263.4	138.5	5
39	7121	1.4	0.6	0.8	220	85.7	51.9	1
39	7221	0.8	0.4	1	56.5	26.6	26.0	
39	7321	1.6	0.8	0.8	350	129.4	74.4	2
39	7421	1.1	0.6	0.5	100.5	40.7	16.4	1
39	7521	0.9	0.4	0.01	50	20.2	3.9	1
39	7622	1.5	0.5	1	229	91.9	77.0	1
39	7722	1.2	0.4	1	148	62.4	54.9	
39	7822	1.1	0.4	1	125	53.7	48.1	
39	7922	0.9	0.3	1	53	25.1	24.7	
40	112	4.0	3	0.5	2870	795.0	220.6	26
40	212	4.2	3	0.4	3080	832.2	194.3	33
40	312	6.2	3.7	0.7	10210	2534.3	848.6	57
40	412	3.9	2.6	0.4	2160	607.5	147.6	24
40	513	4.9	3.3	0.6	5230	1376.7	421.2	37
40	613	4.3	3.1	0.7	3710 *	1032.6	387.0	23
40	713	4.7	2.4	0.5	3030	834.2	230.0	27
40	814	7.7	4.3	0.8	17435	4143.0	1541.0	77
40	915	2.3	1.4	0.7	920	299.8	131.2	6
40	1016	3.0	1.8	0.5	1100	339.6	104.8	11

3	23	12	2.7	1.8	0.8	1420	448.1	220.3	85.9
3	24	12	2.8	2.1	0.5	920	289.8	91.3	96.9
3	25	12	1.9	1	0.9	530	190.2	123.0	30.7
3	26	12	1.6	0.8	0.9	360*	134.9	91.1	21.9
3	27	12	2.4	1.3	0.9	920	310.1	188.7	49.7
3	28	12	2.0	1.3	0.8	640	221.0	118.8	42.7
3	29	12	2.2	1.3	0.9	930	313.1	190.3	50.2
3	30	12	2.3	1.4	0.8	835*	279.8	146.0	54.0
3	31	12	1.7	1.3	0.8	520	183.8	101.1	35.6
3	32	12	1.7	1.3	0.7	420	149.6	71.4	34.9
3	33	12	1.7	0.9	0.9	430	158.0	104.6	25.5
3	34	12	1.2	0.8	0.8	160	64.6	40.5	12.7
3	35	13	0.9	0.5	1	116.5*	50.5	45.6	6.9
3	36	13	1.2	0.6	1	147	62.0	54.6	8.4
3	37	13	1.5	0.6	1	215	86.9	73.3	11.8
3	38	13	0.8	0.4	1	53.5	25.3	24.9	3.5
3	39	13	0.7	0.3	1	37	18.2	18.7	2.5
3	40	13	1.2	0.5	1	170.5	70.7	61.2	9.6
3	41	13	0.9	0.4	1	75	34.1	32.4	4.7
4	15	12	1.1	0.6	0.6	110	44.8	21.1	12.8
4	25	17	1.4	0.8	0.8	370	135.9	77.6	26.5
4	36	0.7	0.6	0.7	39*	18.2	11.3	4.4	
4	46	1.3	0.6	0.4	37.5	16.7	6.4	7.0	
4	56	0.8	0.6	0.8	59.5	26.9	18.8	5.3	
4	66	2.0	0.6	0.7	390*	140.1	67.4	32.7	
4	76	1.0	0.9	0.6	100	41.2	19.6	11.8	
4	86	1.3	0.9	0.8	200	78.8	48.2	15.4	
4	96	1.1	1	0.6	140*	55.5	25.4	15.8	
4	106	1.1	0.8	0.4	50	21.5	8.0	8.9	
8	17	1.3	1	0.5	110	44.1	17.6	15.1	
8	27	1.9	1.7	0.6	320	115.5	48.2	32.5	
8	37	1.2	0.7	0.6	70*	30.0	14.8	8.6	
8	47	1.0	0.9	0.8	60	27.1	18.9	5.4	
8	58	0.7	0.2	1	23	12.0	12.9	1.7	
8	68	0.6	0.6	0.7	22	10.9	7.3	2.6	
8	78	0.8	0.5	0.8	40	18.9	13.8	3.8	
8	88	1.1	0.8	0.9	90	39.5	31.1	6.5	
8	98	1.2	0.8	0.9	100	43.3	33.8	7.1	
8	108	1.5	1.2	1	290*	113.3	92.4	15.3	
8	119	1.5	1	0.9	150	62.1	46.2	10.2	
8	129	1.3	0.9	0.8	120	50.1	32.4	9.9	
8	139	0.9	0.7	1	70	32.1	30.7	4.4	
8	149	1.5	1.1	1	210	85.1	72.0	11.5	
8	159	1.0	0.7	1	80	36.2	34.0	5.0	
8	169	1.5	1	1	290	113.3	92.4	15.3	
8	179	1.2	0.8	1	140*	59.4	52.5	8.1	
8	189	1.6	1.1	1	340	130.5	104.6	17.6	
8	199	1.3	0.8	1	200	81.5	69.3	11.1	
8	20	10	1.3	0.7	1	130	55.6	49.6	7.6
8	21	10	1.0	0.5	1	70	32.1	30.7	4.4
8	22	10	1.0	0.5	0.8	40	18.9	13.8	3.8
8	23	10	1.1	0.4	0.9	80*	35.6	28.4	5.9
13	18	2.8	1.8	0.7	760	253.1	113.2	58.7	
13	28	3.5	2.2	0.6	1670	500.2	173.8	138.2	
13	38	2.9	1.6	0.4	800	251.8	68.3	101.3	
13	48	2.7	1.8	0.4	750	237.8	65.0	95.7	
13	59	1.8	1.1	0.4	280*	99.2	30.3	40.4	
13	69	1.6	1.2	0.5	280	100.9	36.3	34.2	

40	11	16	2.1	1.5	0.5	670	218.8	71.4	7
40	12	16	3.9	2.1	0.8	3000	869.9	393.6	16
40	13	16	2.8	1.8	0.8	1460	459.3	225.1	8
40	14	16	3.4	2.1	0.7	2500	727.6	284.9	16
40	15	16	1.9	1.4	0.6	530	180.8	71.4	5
40	16	16	3.3	1.9	0.7	2160	639.1	254.4	14
40	17	15	4.1	2.5	0.8	3820	1077.8	474.7	20
40	18	17	1.6	1.1	0.8	400	145.7	82.5	2
40	19	17	3.5	2.1	0.8	2240	671.4	313.8	12
40	20	17	4.0	2	0.8	3440*	982.2	437.7	18
40	21	17	4.8	2.3	0.8	6280	1675.0	698.0	31
40	22	17	1.0	0.5	0.6	80	33.8	16.5	
40	23	17	1.3	0.8	0.7	200	77.5	40.2	1
40	24	17	1.6	1	0.8	320	119.5	69.4	2
40	25	17	0.9	0.7	0.7	90	38.2	21.6	
40	26	18	2.9	1.9	0.8	1570	489.8	238.2	9
40	27	18	1.3	0.6	0.6	200	76.2	33.5	2
40	28	18	2.8	1.7	0.8	1530	478.8	233.5	9
40	29	18	1.8	1	0.5	430	147.6	50.6	4
40	30	18	3.7	2.3	0.9	3640	1050.3	548.3	16
40	31	18	3.5	2.4	0.7	260	97.8	49.3	2
40	32	19	3.9	1.8	0.7	2970	847.7	325.7	19
40	33	19	2.0	1.1	0.8	720	245.4	130.1	4
40	34	19	1.7	1.2	0.7	460	162.1	76.7	3
40	35	19	2.2	1.5	0.7	1140*	362.6	155.0	8
40	36	19	2.2	1.4	0.7	820	270.7	120.0	6
40	37	19	2.8	1.8	0.6	1570	473.6	165.7	13
40	38	19	1.0	0.4	0.6	80	33.8	16.5	
40	39	18	1.0	0.5	0.8	137	56.3	35.9	1
40	40	20	1.0	1.2	0.7	570	196.1	90.5	4
40	41	20	1.7	1.1	0.6	460	159.4	63.9	4
40	42	20	1.7	1.2	0.7	386	138.8	66.9	3
40	43	20	1.2	0.4	1	161.5	67.4	58.7	
40	44	20	1.4	0.6	0.8	216	84.3	51.1	1
40	45	20	1.8	0.5	1	319	123.3	99.5	1
40	46	20	1.2	0.4	1	154.5	64.8	56.7	
40	47	20	1.1	0.6	0.9	131	55.1	41.6	
40	48	20	1.6	0.7	0.9	320.5	121.7	83.3	1
40	49	20	1.7	0.8	0.9	424*	156.0	103.5	2
40	50	20	1.0	0.5	0.5	77	32.1	13.3	1
41	18	3.4	2.3	0.8	1680	520.2	251.0	9	
41	21	0.9	0.7	0.7	103	43.0	24.0	1	
41	31	0.8	0.5	0.8	77.5	34.0	23.1		
41	41	0.9	0.9	0.7	115	47.4	26.2	1	
41	51	1.0	0.8	0.4	93*	37.3	12.9	1	
41	61	1.3	1.1	0.5	219	81.2	30.0	2	
41	71	1.0	0.8	0.2	60.5	24.6	6.4	1	
41	81	1.0	0.9	0.7	180	70.5	37.0	1	
41	91	1.2	0.9	0.6	168.5	65.4	29.3	1	
41	101	0.9	0.5	0.6	78	33.0	16.1		
41	111	1.2	0.8	0.5	167.5	64.0	24.4	2	
41	121	0.9	0.7	0.7	149	59.7	32.0	1	
41	131	1.0	0.8	0.7	93	39.3	22.2		
41	141	0.8	0.7	0.6	71.5	30.6	15.1		
41	151	1.0	0.7	0.8	161	65.0	40.7	1	
41	161	1.1	0.8	0.8	170	68.2	42.5	1	
42	19	3.2	1.9	0.8	970	319.6	164.0	6	
42	21	4.2	4	0.6	2280	659.3	221.2	18	

13	79	1.0	0.6	0.2	30	13.2	3.7	8.0
13	89	2.3	1.8	0.6	880	283.4	105.7	78.9
13	99	2.1	1.3	0.4	270	96.1	29.4	39.1
13	109	0.9	0.5	0.4	10	5.2	2.3	2.2
13	119	1.8	1	0.8	290	109.5	64.3	21.4
13	1210	2.1	1.5	0.7	860	282.4	124.5	65.4
13	1310	2.3	1.6	0.6	710	234.3	89.5	65.4
13	1410	2.6	1.6	0.7	1160	368.2	157.1	85.0
13	1510	1.6	1.1	0.6	290 *	105.9	44.7	29.8
13	1610	1.3	0.9	0.6	250	92.8	39.8	26.2
13	1710	2.1	1.3	0.7	640	217.3	99.0	50.5
13	1810	2.4	1.4	0.7	980	317.1	137.8	73.3
13	1910	0.7	0.4	0.5	8.5	4.5	2.4	1.6
13	2010	2.3	1.6	0.6	630	210.7	81.6	58.9
13	2110	2.0	1.4	0.7	330	120.8	59.3	28.3
13	2210	2.2	1.5	0.7	680	229.3	103.8	53.3
13	2310	2.0	1.3	0.6	540	183.8	72.4	51.4
13	2410	2.1	1.6	0.6	580	195.8	76.5	54.8
13	2511	1.1	0.7	0.7	140 *	56.5	30.5	13.4
13	2611	2.3	1.3	0.7	810	267.8	118.9	62.1
13	2711	1.2	0.8	0.6	150	59.0	26.8	16.8
13	2811	2.0	1.2	0.7	600	205.2	94.2	47.7
13	2911	2.2	1.1	0.8	820	275.4	143.9	53.1
13	3011	1.3	0.8	0.7	200	77.5	40.2	18.2
13	3111	2.7	1.6	0.7	1195	378.1	160.7	87.2
13	3211	2.1	1.1	0.7	670	226.3	102.6	52.6
13	3311	1.5	0.8	0.8	280	106.2	62.5	20.7
13	3412	0.6	0.3	1	10	5.7	6.8	0.8
13	3512	0.9	0.4	1	71 *	32.5	31.0	4.5
13	3612	1.0	0.5	1	90	40.1	37.3	5.5
13	3712	1.4	0.6	1	250	99.3	82.4	13.4
13	3812	1.6	0.7	0.9	430	158.0	104.6	25.5
13	3912	0.9	0.5	0.9	110	47.2	36.3	7.7
13	4012	1.2	0.5	1	120	51.8	46.6	7.1
13	4112	1.8	0.8	0.9	490	177.4	115.8	28.6
13	4212	1.7	0.9	0.9	450	164.5	108.4	26.6
13	4312	1.8	0.8	1	440	164.0	127.7	22.1
13	4412	1.3	0.6	1	203	82.6	70.1	11.2
13	4512	1.1	0.5	1	159 *	66.5	58.0	9.0
15	16	3.4	3.1	0.2	1280	369.3	68.4	213.4
15	26	3.3	2.9	0.1	1040	302.0	48.6	210.2
15	36	3.4	2.7	0.05	770	229.4	35.1	175.7
15	47	4.1	3.1	0.3	2400	655.8	133.5	313.1
15	57	3.4	2.8	0.4	1585 *	461.7	116.1	184.3
15	67	2.8	1.9	0.2	820	248.8	48.4	144.5
15	77	3.6	2.4	0.2	1490	422.5	76.9	243.8
15	87	4.3	3.9	0.6	3260	905.3	292.0	248.2
15	98	1.9	1.4	0.6	440	153.3	61.8	43.0
15	108	3.5	3.1	0.7	2320	681.0	268.9	155.9
15	118	1.6	1.3	0.5	220	81.5	30.1	27.7
15	128	2.3	1.5	0.6	720	237.2	90.5	66.2
15	138	1.3	0.8	0.5	90	36.9	15.0	12.7
15	148	2.2	1.7	0.6	520	177.7	70.3	49.8
15	158	3.1	2.9	0.6	1410 *	430.5	152.4	119.2
15	169	1.0	0.8	0.7	80	34.4	19.7	8.2
15	179	1.6	1.4	0.8	30	14.6	11.1	2.9
15	189	3.9	2.7	0.8	2720	797.5	364.8	151.7
15	199	0.7	0.6	0.5	10	5.3	2.7	1.8

42	312	4.1	3.2	0.3	1280	375.6	82.0	18
42	412	3.1	2.4	0.7	1130	359.8	153.9	8
42	513	4.4	3.1	0.6	2350 *	677.2	226.5	18
42	614	4.0	2.9	0.7	1350	421.3	176.7	9
42	714	4.0	3.2	0.8	2055	621.9	293.5	11
42	814	3.4	2.1	0.7	1040	334.3	144.3	7
42	914	2.2	2.1	0.6	560	189.8	74.5	5
42	1014	4.3	4.2	0.8	3040	880.2	397.6	16
42	1115	4.3	3.5	0.7	3060	870.5	333.3	19
42	1215	3.5	1.9	0.7	1350	421.3	176.7	9
42	1315	2.7	2	0.4	600	195.1	54.6	7
42	1415	4.7	3.1	0.8	3950	1110.3	487.2	21
42	1515	3.8	2.9	0.7	1650	503.3	206.4	11
42	1616	4.1	3.4	0.7	2740	789.2	305.9	18
42	1716	4.2	3.1	0.9	3140	921.3	488.9	14
42	1816	3.8	3	0.7	2120	628.6	250.7	14
42	1916	3.0	2	0.8	1410	445.3	219.1	8
42	2017	3.6	2.3	0.8	2320 *	692.6	322.4	13
42	2117	4.6	2.6	0.8	4550	1258.6	543.7	23
42	2217	2.8	2.1	0.8	1260	403.0	200.8	7
42	2317	2.8	2.2	0.7	1040	334.3	144.3	7
42	2417	3.7	2.5	0.8	2100	634.0	298.5	12
42	2517	2.1	1.6	0.7	810	267.8	118.9	6
42	2617	3.0	2.2	0.7	1440	446.1	185.8	10
42	2718	3.4	2.1	0.8	1990	604.5	286.3	11
42	2818	2.8	1.6	0.8	1240	397.4	198.4	7
42	2918	2.9	2	0.8	1250	400.2	199.6	7
42	3018	3.4	2.2	0.9	2320	704.4	386.6	11
42	3118	1.0	0.8	0.7	110	45.6	25.3	1
42	3219	2.4	1.4	0.8	900	299.0	154.7	5
42	3319	2.2	1.1	0.8	630	218.0	117.3	4
42	3419	2.2	1.1	0.8	640	221.0	118.8	4
42	3519	2.2	1	0.8	580 *	202.5	110.0	3
42	3619	1.8	1	0.9	430	158.0	104.6	2
42	3719	2.2	1.4	0.9	670	234.1	147.6	3
42	3819	2.3	1.3	0.8	760	257.4	135.7	4
42	3919	2.0	1.3	0.8	560	196.3	107.1	3
42	4020	1.4	0.4	1	165	68.7	59.7	
42	4120	1.2	0.4	1	151.5	63.7	55.9	
42	4220	1.2	0.5	1	185.5	76.2	65.4	1
42	4320	1.7	0.5	1	180	74.2	63.8	1
42	4420	1.0	0.5	0.9	109	46.8	36.1	
42	4520	1.2	0.5	0.9	125	52.8	40.1	
42	4620	1.2	0.5	0.9	131	55.1	41.6	
42	4716	4.8	3.7	0.8	5385	1461.5	619.6	27
43	110	1.3	1	0.7	240	91.1	46.3	2
43	210	2.4	1.3	0.8	1290	411.5	204.5	7
43	310	5.6	2.5	0.7	7590	1948.2	674.3	44
43	411	0.9	0.5	0.7	90	38.2	21.6	
43	511	1.9	1	0.7	580 *	199.1	91.8	4
43	611	1.3	0.7	0.7	140	56.5	30.5	1
43	711	2.1	1.3	0.8	570	199.4	108.6	3
43	811	3.7	1.5	0.7	1700	516.8	211.3	11
44	19	6.7	12.4	0.6	6780	1733.1	515.2	47
44	213	1.5	1.1	0.5	240	88.0	32.2	2
44	313	0.9	0.7	0.4	80	32.7	11.5	1
44	413	2.4	1.8	0.7	930	302.7	132.3	7
44	513	3.6	2.3	0.6	2220 *	643.9	216.7	17

15	209	3.0	2.4	0.8	1710	528.4	254.5	101.1
15	219	3.4	2.4	0.8	2120	639.4	300.7	122.0
15	229	1.2	0.9	0.6	150	59.0	26.8	16.8
15	2310	1.3	0.9	0.9	270	104.6	72.9	17.0
15	2410	1.9	1.2	1	460	170.6	132.2	22.9
15	2510	1.6	1.4	0.9	340 *	128.3	87.2	20.8
15	2610	1.2	1	0.9	100	43.3	33.8	7.1
15	2710	0.9	0.6	0.9	50	23.4	19.7	3.9
15	2810	1.2	1	0.8	150	61.0	38.5	12.0
15	2910	1.6	1.2	0.8	200	78.8	48.2	15.4
15	3010	0.7	0.5	0.3	12	6.0	2.2	3.0
15	3110	2.6	1.8	1	1170	390.4	272.6	51.9
15	3211	1.3	0.9	1	110	48.0	43.6	6.6
15	3311	1.8	1.1	1	340	130.5	104.6	17.6
15	3411	0.7	0.4	0.8	25	12.5	9.6	2.5
15	3511	0.9	0.5	0.9	45 *	21.3	18.2	3.5
15	3611	0.6	0.4	1	29.5	14.9	15.7	2.1
15	3711	1.6	0.6	0.9	230	90.7	64.4	14.8
15	3811	0.7	0.3	0.9	25.5	12.9	11.7	2.2
15	3911	1.6	0.9	1	240	95.8	79.8	13.0
15	4011	0.6	0.3	0.9	29	14.5	12.9	2.4
15	4111	1.8	1	1	380	144.0	114.0	19.4
15	4212	1.3	0.7	1	140	59.4	52.5	8.1
15	4312	1.8	0.7	1	360	137.2	109.3	18.5
15	4412	0.8	0.3	1	27	13.8	14.7	1.9
15	4512	1.1	0.6	1	108.5 *	47.4	43.1	6.5
15	4612	1.1	0.5	1	88	39.3	36.7	5.4
15	4712	1.3	0.5	1	120	51.8	46.6	7.1
15	4812	1.0	0.5	1	77.5	35.2	33.2	4.8
15	498	2.8	2.4	0.6	122.5	49.3	22.9	14.0
15	508	3.4	2.1	0.8	2280	682.0	318.1	130.0
19	18	1.1	1	0.3	80	32.1	9.5	15.9
19	28	1.2	0.8	0.3	80	32.1	9.5	15.9
19	38	2.2	1.3	0.7	575	197.6	91.1	46.0
19	49	1.1	0.8	0.3	60	24.9	7.6	12.4
19	59	1.7	1.5	0.7	470 *	165.3	78.0	38.5
19	69	1.5	0.9	0.4	230	83.3	26.0	34.0
19	79	1.5	0.9	0.3	155	57.7	15.9	28.5
19	810	1.9	1.2	0.9	680	237.2	149.3	38.1
19	910	1.8	1	0.5	350	123.0	43.1	41.6
19	1010	1.4	0.9	0.8	230	89.2	53.7	17.5
19	1110	0.9	0.7	0.7	50	22.7	13.7	5.4
19	1210	1.6	1	0.9	480	174.2	113.9	28.1
19	1310	1.1	0.8	0.8	90	38.8	25.9	7.7
19	1410	1.1	1	0.6	50	22.3	11.4	6.4
19	1510	1.3	0.8	0.8	160 *	64.6	40.5	12.7
19	1610	1.5	1.2	0.6	20	9.9	5.6	2.9
19	1710	0.9	0.5	1	90	40.1	37.3	5.5
19	1811	1.5	0.8	1	320	123.6	99.8	16.7
19	1911	1.0	0.7	0.8	80	35.0	23.7	6.9
19	2011	0.9	0.6	0.6	50	22.3	11.4	6.4
19	2111	0.8	0.5	0.6	50	22.3	11.4	6.4
19	2211	0.9	0.5	0.8	70	31.1	21.3	6.2
19	2311	1.7	0.8	1	410	154.0	120.9	20.7
19	2411	1.1	0.6	0.5	80	33.2	13.7	11.4
19	2511	1.1	0.8	0.8	120 *	50.1	32.4	9.9
19	2612	1.4	0.8	1	280	109.8	89.9	14.8
19	2712	1.0	0.5	1	120.5	52.0	46.8	7.1

44	614	1.0	0.6	0.5	70	29.5	12.4	1
44	714	1.7	0.8	0.2	90	35.1	8.7	2
44	814	3.1	1.9	0.8	1670	517.4	249.9	5
44	915	3.2	1.4	0.8	2130	642.0	301.8	12
44	1016	1.6	0.9	0.6	250	92.8	39.8	2
44	1116	0.9	0.7	0.7	80	34.4	19.7	
44	1216	1.4	0.8	0.8	340	126.1	72.7	2
44	1316	1.2	0.7	0.8	150	61.0	38.5	1
44	1416	0.8	0.5	0.7	90	38.2	21.6	
44	1516	1.0	0.6	0.6	130	52.0	24.0	1
44	1617	0.8	0.3	1	60	28.0	27.2	
44	1717	2.8	2	0.7	950	308.5	134.5	5
44	1817	1.6	1.3	0.5	290	104.1	37.3	3
44	1913	1.0	0.5	0.8	120	50.1	32.4	
44	2013	2.6	1.2	0.7	730 *	244.2	109.7	5
44	2113	2.9	1.6	0.8	1620	503.7	244.1	9
44	2213	1.1	0.9	0.2	90	35.1	8.7	2
44	2313	1.5	0.8	0.4	160	60.4	19.6	2
44	2414	1.4	0.7	0.8	140	57.4	36.5	1
44	2514	1.4	0.7	0.8	210	82.3	50.0	1
44	2614	1.0	0.5	0.8	120	50.1	32.4	
44	2714	0.9	0.5	0.6	70	30.0	14.8	
45	113	2.7	2.3	0.8	1110	360.2	182.0	6
45	213	2.9	1.7	0.6	860	277.7	103.9	5
45	314	2.2	0.8	0.6	370	131.4	54.0	3
45	414	2.4	1.8	0.2	400	131.6	27.7	7
45	514	1.9	1	0.5	390 *	135.4	46.9	4
45	615	2.1	1.5	0.7	780	259.0	115.5	6
45	716	2.9	2.3	0.7	970	314.2	136.7	5
45	816	3.7	1.3	0.6	920	294.8	109.4	8
45	916	5.4	3.1	0.8	5070	1385.4	591.3	26
45	1016	3.8	2.5	0.7	2910	832.5	320.6	19
45	1117	3.8	3	0.8	3440	982.2	437.7	18
45	1217	2.3	0.8	0.2	190	68.0	15.6	4
45	1317	1.4	0.8	0.5	140	54.6	21.2	1
45	1417	4.9	3	0.9	5580	1534.1	763.7	24
45	1518	2.7	2.1	0.8	1840 *	563.9	269.4	10
45	1618	2.9	2.3	0.7	1870	562.4	227.5	12
45	1718	4.2	2.3	0.8	3210	923.7	414.8	17
45	1818	3.9	2.4	0.9	3950	1129.2	584.2	15
45	1918	1.8	0.8	0.6	210	79.5	34.8	2
45	2018	1.0	0.8	0.6	130	52.0	24.0	1
45	2119	3.1	1.5	0.8	1760	542.1	260.3	10
45	2219	2.2	1.1	0.8	920	304.9	157.4	5
45	2319	1.2	0.8	0.7	190	74.0	38.6	1
45	2419	1.8	1.4	0.7	710	238.3	107.3	5
45	2519	1.2	0.8	0.5	90	36.9	15.0	1
45	2619	1.0	0.8	0.6	110	44.8	21.1	1
45	2719	0.9	0.6	0.7	120	49.2	27.0	1
45	2820	1.5	0.8	0.8	360	132.7	76.0	2
45	2920	0.9	0.5	0.9	130	54.7	41.4	
45	3020	0.8	0.4	1	60	28.0	27.2	
45	3120	0.8	0.4	1	50	23.8	23.6	
45	3220	0.9	0.6	0.9	90	39.5	31.1	
45	3320	1.4	0.5	1	220	88.7	74.6	1
45	3420	0.9	0.6	0.9	120	50.9	38.9	
45	3520	0.9	0.4	1	90 *	40.1	37.3	
45	3618	1.3	0.7	0.2	70	28.1	7.2	1

19	28	12	1.1	0.5	1	130	55.6	49.6	7.6
19	29	12	1.2	0.9	1	160	66.9	58.3	9.1
19	30	12	1.0	0.5	1	105	46.0	42.0	6.3
19	31	12	0.9	0.4	1	85.5	38.4	35.8	5.3
19	32	12	1.0	0.5	0.9	104	44.9	34.8	7.4
19	33	12	0.9	0.4	1	71.5	32.7	31.2	4.5
19	34	12	1.1	0.6	0.9	140	58.4	43.8	9.6
19	35	12	1.0	0.3	1	45.5 *	21.9	22.0	3.0
21	15		6.2	5	0.7	7330	1888.9	656.3	426.9
21	25		4.3	2.8	0.7	2190	647.0	257.1	148.3
21	36		5.2	3.3	0.8	4340	1207.0	524.1	228.4
21	46		5.2	2.7	0.8	5530	1496.3	632.5	282.3
21	56		3.7	2.9	0.7	1650 *	503.3	206.4	115.7
21	66		4.3	2.9	0.8	3290	944.1	422.8	179.2
21	77		1.9	1.5	0.6	370	131.4	54.0	36.9
21	87		1.9	1.3	0.7	480	168.4	79.2	39.3
21	97		4.1	2.5	0.8	2840	828.6	377.2	157.5
21	108		1.8	1	0.9	450	164.5	108.4	26.6
21	118		2.6	1.9	0.8	1160	374.5	188.4	71.9
21	128		1.4	0.9	0.7	240	91.1	46.3	21.4
21	138		1.7	1.4	0.5	340	119.9	42.2	40.5
21	148		1.0	0.5	0.4	90	36.3	12.5	15.0
21	158		1.3	0.7	0.5	90 *	36.9	15.0	12.7
21	168		4.9	3.5	0.8	5040	1378.1	588.5	260.3
21	179		1.8	1.1	0.8	520	183.8	101.1	35.6
21	189		1.3	0.8	0.7	290	107.7	53.6	25.3
21	199		2.4	1.3	0.8	970	319.6	164.0	61.5
21	209		4.9	3.4	0.9	5420	1495.0	746.7	234.8
21	219		3.9	2.4	0.8	2870	836.4	380.3	159.0
21	229		3.1	1.8	0.6	1510	457.5	160.7	126.5
21	239		4.8	3.4	0.8	4820	1324.7	568.5	250.3
21	249		4.3	3.3	0.8	4240	1182.3	514.7	223.8
21	2510		3.8	2.9	0.7	2740 *	789.2	305.9	180.4
21	2610		2.8	1.9	0.8	1440	453.7	222.7	86.9
21	2710		3.2	2.7	0.7	1770	535.7	218.0	123.1
21	2810		3.5	2.8	0.6	2400	690.0	230.2	189.8
21	2910		1.2	0.8	0.7	180	70.5	37.0	16.6
21	3010		2.3	1.3	0.6	810	263.3	99.2	73.3
21	3110		1.1	0.9	0.4	80	32.7	11.5	13.5
21	3211		1.8	0.9	0.7	530	183.8	85.6	42.8
21	3311		2.6	1.9	0.6	1100	345.4	125.7	95.9
21	3411		2.7	1.7	0.8	1360	431.3	213.1	82.7
21	3511		1.3	0.6	0.8	140 *	57.4	36.5	11.3
21	3611		1.7	1.9	0.7	340	124.0	60.6	29.0
21	3711		1.8	1.3	0.8	550	193.2	105.6	37.4
21	3811		4.6	2.9	0.8	4610	1273.3	549.2	240.8
21	3911		2.5	1.6	0.9	1130	372.2	221.3	59.5
21	4012		2.5	1.6	0.9	1070	354.6	212.1	56.7
21	4112		2.4	1.7	0.9	910	307.1	187.1	49.2
21	4212		2.9	1.7	0.9	1400	450.1	261.3	71.8
21	4312		1.5	1	0.8	270 *	102.8	60.8	20.1
21	4412		1.3	0.8	0.9	180	73.0	53.2	11.9
21	4512		1.6	1	0.9	440	161.2	106.5	26.1
21	4613		2.0	1	1	580	209.5	158.2	28.1
21	4713		1.5	0.8	1	280	109.8	89.9	14.8
21	4813		2.0	1.2	1	670	238.1	176.9	31.9
21	4913		1.1	0.6	0.7	120	49.2	27.0	11.7
21	5013		1.4	0.9	0.8	290	109.5	64.3	21.4

45	37	18	1.2	1	0.6	90	37.5	18.0	1
45	38	18	1.3	0.9	0.8	340	126.1	72.7	2
45	39	18	0.8	0.6	0.5	20	9.7	4.7	
45	40	19	1.5	1.1	0.7	260	97.8	49.3	2
45	41	19	1.4	0.9	0.8	280	106.2	62.5	2
45	42	19	0.9	0.6	0.7	60	26.6	15.8	
45	43	19	1.4	0.9	0.6	160	62.5	28.2	1
45	44	19	1.6	1.2	0.7	320	117.5	57.9	2
45	45	19	1.4	1	0.7	230	87.7	44.8	2
45	46	19	1.7	1.2	0.8	520	183.8	101.1	3
45	47	19	1.8	1.2	0.7	610	208.3	95.4	4
45	48	19	1.6	1	0.8	550	193.2	105.6	3
45	49	19	1.0	0.8	0.6	70	30.0	14.8	
45	50	19	0.8	0.7	0.2	40 *	17.1	4.7	1
45	51	20	1.6	0.9	0.7	400	143.2	68.8	3
45	52	20	0.9	0.5	0.8	90	38.8	25.9	
45	53	20	1.1	0.6	0.8	140	57.4	36.5	1
45	54	20	1.5	0.8	0.9	340	128.3	87.2	2
45	55	20	1.1	0.7	0.7	140	56.5	30.5	1
45	56	20	1.2	0.7	0.8	230	89.2	53.7	1
45	57	20	1.0	0.6	0.7	80	34.4	19.7	
45	58	20	1.9	1.3	0.8	600	208.7	113.0	4
45	59	20	1.2	1.8	0.7	160	63.6	33.8	1
45	60	20	1.5	1	0.8	360	132.7	76.0	2
45	61	20	0.9	0.6	0.7	80	34.4	19.7	
45	62	20	1.3	0.7	0.8	240	92.6	55.5	1
45	63	20	1.0	0.6	0.7	70	30.5	17.8	
45	64	20	1.2	0.7	0.7	160	63.6	33.8	1
45	65	20	1.8	1.1	0.8	590 *	205.6	111.5	3
45	66	21	1.2	0.5	1	120	51.8	46.6	
45	67	21	1.7	0.5	1	230	92.2	77.2	1
45	68	21	1.2	0.5	1	140	59.4	52.5	
45	69	21	1.2	0.5	1	140	59.4	52.5	
46	14		7.1	2.1	0.6	13000	3087.2	853.5	83
46	211		7.2	6.2	0.4	13900	3167.0	625.2	123
46	312		6.1	3.7	0.4	6670	1651.3	353.8	64
46	412		5.8	4.6	0.8	7360	1928.1	789.4	36
46	513		6.5	5	0.7	9640 *	2408.4	811.6	54
46	613		4.3	3.7	0.6	3070	858.3	278.7	23
46	714		4.1	2.9	0.6	3095	864.5	280.4	23
46	815		5.6	3.8	0.7	6780	1762.7	617.7	39
46	915		4.7	3.3	0.8	4130	1155.0	504.3	21
46	1015		3.7	2.8	0.3	1430	414.3	89.4	19
46	1115		6.0	4.3	0.8	7200	1890.9	776.1	35
46	1215		6.4	4.2	0.7	10300	2554.1	854.4	57
46	1316		6.7	4	0.7	12080	2942.0	966.8	66
46	1416		6.6	4.3	0.7	9475	2371.8	800.8	53
46	1516		5.1	4	0.7	5650	1499.5	536.3	33
46	1617		4.6	3.6	0.6	3240	900.4	290.6	24
46	1717		2.0	1.5	0.4	390	133.1	39.1	5
46	1817		4.5	2.6	0.7	3590	1002.9	377.3	27
46	1917		3.1	2.1	0.6	1380	422.4	149.9	11
46	2017		1.9	1.5	0.6	400 *	140.8	57.4	3
46	2117		3.8	2.8	0.7	2490	725.0	284.1	16
46	2217		4.9	3.1	0.7	5720	1516.0	541.4	34
46	2318		2.2	1.6	0.8	670	230.2	123.1	4
46	2418		2.7	2	0.7	1170	371.1	158.1	8
46	2518		2.6	1.4	0.7	970	314.2	136.7	7

21	5113	1.7	1	0.8	470	168.1	93.5	32.6
21	5213	0.9	0.6	0.8	70	31.1	21.3	6.2
21	5313	2.0	1.2	0.7	630	214.3	97.8	49.8
21	5413	1.9	1.2	0.7	570	196.1	90.5	45.6
21	5514	0.8	0.4	0.8	40*	18.9	13.8	3.8
21	5614	1.6	0.7	1	200	81.5	69.3	11.1
21	5714	1.0	0.4	1	70	32.1	30.7	4.4
21	5814	1.1	0.4	0.9	80	35.6	28.4	5.9
21	5914	2.5	0.8	1	420	157.4	123.2	21.2
21	6014	1.0	0.4	0.9	85	37.5	29.8	6.2
21	6114	1.3	0.7	0.8	190	75.3	46.3	14.8
21	6214	1.4	0.6	1	160	66.9	58.3	9.1
21	6314	1.1	0.5	0.9	90	39.5	31.1	6.5
27	12	0.7	0.6	0.2	34	14.8	4.1	8.9
27	23	0.7	0.5	0.8	36*	17.2	12.7	3.4
27	33	0.6	0.7	0.7	47.5	21.6	13.2	5.2
27	44	0.6	0.4	0.6	20*	9.9	5.6	2.9
31	16	1.4	1.1	0.6	240	89.5	38.6	25.3
31	26	2.5	1.6	0.5	600	198.4	65.5	66.6
31	37	1.2	1	0.5	90*	36.9	15.0	12.7
31	47	0.9	0.5	0.4	29	13.3	5.2	5.6
31	57	1.1	0.7	0.7	130	52.9	28.8	12.5
31	67	1.4	0.8	0.5	100	40.5	16.3	13.9
31	77	1.1	0.6	0.8	100	42.6	28.1	8.4
31	88	0.8	0.5	0.7	60	26.6	15.8	6.4
31	98	1.5	0.6	0.5	100	40.5	16.3	13.9
31	108	1.0	0.6	0.7	80*	34.4	19.7	8.2
31	118	1.3	0.8	0.8	180	71.8	44.4	14.1
31	128	1.6	0.9	0.8	250	96.0	57.3	18.8
31	138	1.3	0.7	0.5	120	47.6	18.8	16.3
31	148	1.3	0.6	0.4	90*	36.3	12.5	15.0
31	158	1.1	0.5	0.9	112	47.9	36.9	7.9
35	17	3.7	2.4	0.5	1800	525.6	153.6	174.4
35	27	2.8	2.3	0.7	950	308.5	134.5	71.4
35	38	3.3	2.2	0.7	1360	424.0	177.7	97.7
35	48	2.8	2.3	0.8	1460	459.3	225.1	88.0
35	58	1.6	1.4	0.7	280*	104.4	52.2	24.5
35	68	1.7	1.1	0.6	250	92.8	39.8	26.2
35	79	3.4	1.9	0.8	2190	658.0	308.3	125.5
35	89	3.2	2.4	0.7	1920	575.7	232.2	132.1
35	99	1.8	1.4	0.5	340	119.9	42.2	40.5
35	109	3.1	2	0.7	1550	476.2	196.7	109.6
35	119	2.4	1.5	0.9	820	280.0	172.6	44.9
35	129	2.8	1.8	0.9	1170	383.8	227.4	61.3
35	139	2.7	2.1	0.8	1220	391.7	195.9	75.2
35	149	1.9	1.2	0.9	530	190.2	123.0	30.7
35	159	1.1	0.9	0.7	90*	38.2	21.6	9.1
35	1610	2.7	1.7	0.7	1040	334.3	144.3	77.3
35	1710	1.1	0.9	0.7	140	56.5	30.5	13.4
35	1810	1.1	1	0.6	90	37.5	18.0	10.7
35	1910	2.1	1.5	0.8	720	245.4	130.1	47.4
35	2010	2.1	1.3	0.7	610	208.3	95.4	48.4
35	2110	1.3	1.1	0.5	160	61.4	23.5	21.0
35	2210	1.9	1.5	0.6	490	168.6	67.1	47.2
35	2310	2.7	1.6	0.8	1140	368.8	185.8	70.9
35	2410	2.6	2	0.8	1230	394.5	197.1	75.7
35	2510	1.7	1.3	0.8	530*	187.0	102.6	36.2
35	2610	1.6	1.3	0.8	450	161.7	90.4	31.4

46	2618	5.4	3.3	0.8	8210	2124.4	859.3	39
46	2718	1.4	0.9	0.7	180	70.5	37.0	1
46	2818	4.2	2.7	0.8	4160	1162.5	507.2	27
46	2918	5.1	2.7	0.8	5910	1587.2	665.9	29
46	3018	5.0	3.5	0.8	5600	1513.1	638.7	28
46	3118	5.9	3.6	0.8	8700	2236.5	898.8	41
46	3219	4.5	2.8	0.8	5070	1385.4	591.3	26
46	3319	1.3	0.6	0.2	80	31.6	8.0	1
46	3419	4.0	2.4	0.7	3110	883.1	337.5	20
46	3519	1.8	1.2	0.7	380*	136.9	66.1	3
46	3619	3.4	2.4	0.6	2440	700.2	233.2	19
46	3719	2.2	1.7	0.5	760	244.7	78.7	8
46	3819	5.1	2.3	0.8	5275	1435.0	609.7	27
46	3919	3.5	2.1	0.7	2500	727.6	284.9	16
46	4019	4.5	2.3	0.8	4080	1142.6	499.6	21
46	4119	3.3	2	0.8	2240	671.4	313.8	12
46	4219	3.0	2.2	0.7	1720	522.2	213.2	12
46	4319	3.6	2.1	0.8	3170	913.5	410.8	17
46	4420	3.2	1.7	0.7	2140	633.9	252.6	14
46	4520	2.3	1.5	0.7	930	302.7	132.3	7
46	4620	2.3	1.1	0.8	910	302.0	156.0	5
46	4720	2.2	1.2	0.8	830	278.3	145.3	5
46	4820	1.4	1	0.6	230	86.2	37.3	2
46	4920	1.2	0.8	0.3	110	42.6	12.2	2
46	5020	1.3	0.7	0.2	80*	31.6	8.0	1
46	5121	0.9	0.3	0.8	93.5	40.1	26.7	
46	5221	1.4	0.4	0.8	167.5	67.3	42.0	1
46	5321	1.6	0.6	0.8	275.5	104.7	61.8	2
46	5421	0.8	0.2	0.8	48.5	22.4	16.1	
46	5521	0.8	0.3	0.9	60	27.5	22.7	
46	5621	1.3	0.3	1	92	40.9	37.9	
46	5721	1.1	0.3	0.9	102.5	44.3	34.4	
46	5821	1.2	0.5	0.8	155.5	63.0	39.6	1
46	5921	1.2	0.1	0.2	9.5	4.8	1.5	
46	6012	5.6	4.7	0.6	6200	1601.0	480.7	43
47	114	3.5	1.8	0.7	1170	371.1	158.1	8
47	214	2.8	1.2	0.3	520	168.9	40.8	8
47	314	1.0	0.6	0.8	80	35.0	23.7	
47	414	3.4	2.2	0.6	1110	348.2	126.6	9
47	514	2.9	1.9	0.6	1010*	320.2	117.7	8
47	614	6.2	4.1	0.7	9780	2439.4	820.8	54
47	715	2.4	1.2	0.5	440	150.7	51.5	5
47	815	1.8	1	0.6	320	115.5	48.2	3
47	915	1.7	0.7	0.7	360	130.5	63.4	3
47	1015	1.2	0.8	0.7	160	63.6	33.8	1
47	1115	0.8	0.4	0.1	15	7.0	1.8	
47	1216	2.0	1.1	0.7	630	214.3	97.8	4
47	1316	1.6	1	0.8	330	122.8	71.1	2
47	1416	2.1	1	0.8	670	230.2	123.1	4
47	1516	2.6	1.5	0.9	1170	383.8	227.4	6
47	1616	1.4	0.9	0.7	310	114.3	56.4	2
47	1717	2.1	1.3	0.8	820	275.4	143.9	5
47	1817	1.2	0.5	0.7	160.5	63.7	33.9	1
47	1917	1.0	0.4	0.8	127	52.7	33.9	1
47	2017	1.3	0.6	0.8	114.5*	48.0	31.3	
47	2117	1.3	0.7	0.8	216	84.3	51.1	1
47	2217	0.9	0.5	0.7	68.5	29.9	17.5	
47	2317	1.3	0.8	0.8	229	88.8	53.5	1

35	27	10	1.4	1.2	0.3	160	59.4	16.3	29.3
35	28	10	2.4	1.8	0.7	890	291.1	127.9	67.4
35	29	10	2.8	1.8	0.7	1160	368.2	157.1	85.0
35	30	11	1.4	1	0.7	250	94.4	47.8	22.2
35	31	11	1.5	0.9	0.7	280	104.4	52.2	24.5
35	32	11	1.5	0.9	0.9	290	111.4	77.1	18.1
35	33	11	1.8	1.3	0.8	560	196.3	107.1	38.0
35	34	11	1.5	0.9	0.9	280	108.0	75.0	17.5
35	35	11	1.2	0.9	0.6	150 *	59.0	26.8	16.8
35	36	11	1.2	0.7	0.8	140	57.4	36.5	11.3
35	37	11	0.7	0.4	0.9	20	10.4	9.7	1.7
35	38	11	1.6	1.1	0.5	290	104.1	37.3	35.3
35	39	11	1.8	1.2	0.7	440	155.9	74.1	36.4
35	40	11	1.8	1.1	0.6	400	140.8	57.4	39.5
35	41	11	2.0	1.2	0.8	590	205.6	111.5	39.8
35	42	11	2.1	1.3	0.7	630	214.3	97.8	49.8
35	43	11	1.9	1.2	0.7	550	190.0	88.1	44.2
35	44	11	1.7	1.2	0.4	390	133.1	39.1	54.0
35	45	11	2.4	1.4	0.7	720 *	241.2	108.5	56.0
35	46	11	1.1	0.9	0.5	120	47.6	18.8	16.3
35	47	12	1.2	0.7	0.5	130	51.1	20.0	17.5
35	48	12	1.1	1.8	0.5	90	36.9	15.0	12.7
35	49	12	1.5	0.9	0.8	260	99.4	59.1	19.4
35	50	12	1.7	1	0.8	375	137.6	78.5	26.8
35	51	12	2.2	0.8	1	390	147.3	116.3	19.8
35	52	12	1.5	0.9	0.9	330	124.9	85.2	20.3
35	53	12	1.3	0.6	1	140	59.4	52.5	8.1
35	54	12	1.2	0.7	1	120	51.8	46.6	7.1
35	55	12	0.9	0.5	1	60	28.0	27.2	3.9
35	56	12	1.1	0.6	1	90	40.1	37.3	5.5
35	57	12	1.2	0.6	1	120	51.8	46.6	7.1
35	58	12	1.3	0.4	1	50	23.8	23.6	3.3
35	59	12	1.5	0.7	1	240	95.8	79.8	13.0
35	60	12	0.8	0.4	1	47	22.6	22.5	3.1
36	1	10	8.1	4.3	0.6	10950	2651.3	747.2	716.8
36	2	11	7.4	4.4	0.7	9900	2465.9	828.6	555.4
36	3	12	8.6	6	0.8	23230	5343.7	1925.1	991.8
36	4	12	8.8	5.5	0.6	27270	5955.4	1516.2	1593.3
36	5	13	7.6	4.1	0.6	15830 *	3676.4	994.4	989.8
36	6	13	7.4	4.8	0.5	11260	2672.2	636.7	867.9
36	7	13	6.4	3.4	0.7	8380	2127.1	728.1	480.0
36	8	14	5.4	4.2	0.8	6730	1781.0	736.5	335.3
36	9	14	8.3	4.9	0.7	14530	3465.5	1115.7	777.1
36	10	14	9.0	4.7	0.8	17020	4055.4	1512.5	755.4
36	11	14	6.5	4.2	0.8	8150	2110.6	854.4	396.5
36	12	14	8.6	4.9	0.7	20900	4783.9	1479.1	1068.3
36	13	15	4.1	2.4	0.5	1900	551.4	160.2	182.8
36	14	15	8.1	4.6	0.8	13350	3269.6	1252.8	610.7
36	15	15	7.2	4.2	0.8	12410	3064.5	1183.8	572.9
36	16	16	8.1	3.4	0.8	11350	2831.2	1104.6	529.8
36	17	16	9.3	4.8	0.8	25920 *	5889.1	2095.9	1091.6
36	18	16	3.0	1.1	0.7	1010	325.7	141.1	75.3
36	19	17	11.8	5.6	0.7	37685	8069.5	2336.5	1789.9
36	20	17	4.2	2.7	0.7	2880	824.9	318.0	188.4
36	21	17	4.4	2.5	0.6	3750	1025.0	325.4	280.5
36	22	17	7.6	4.1	0.7	14780	3518.3	1130.6	788.8
36	23	18	7.3	4.1	0.8	12400	3062.4	1183.1	572.5
36	24	18	2.4	1.4	0.8	140	57.4	36.5	11.3

47	24	17	1.0	0.8	0.8	210	82.3	50.0	1
49	16	6.9	4.7	0.6	10660	2589.0	731.8	70	
49	26	7.2	4.6	0.5	11255	2671.2	636.5	86	
49	37	8.8	4.6	0.7	20485	4699.6	1456.3	104	
49	47	7.9	4.5	0.7	16280	3833.3	1218.6	85	
49	57	5.8	3.4	0.5	5800 *	1483.7	380.6	48	
49	68	7.1	3.6	0.7	13285	3200.8	1040.8	71	
49	78	6.3	3.6	0.6	10970	2655.6	748.2	71	
49	88	7.1	4	0.7	11470	2809.8	928.8	63	
49	99	7.2	3.3	0.8	16230	3888.0	1457.7	72	
49	109	5.4	2.9	0.8	6760	1788.1	739.1	33	
49	119	5.8	2.8	0.7	9235	2318.5	785.1	52	
49	129	4.6	1.9	0.7	4970	1338.3	485.5	30	
49	139	5.8	3.2	0.8	9480	2413.4	960.7	45	
49	149	5.8	2.8	0.8	7890 *	2050.8	833.2	38	
49	1510	3.8	1.7	0.8	2120 *	639.4	300.7	12	
49	1610	4.9	1.9	0.8	6790	1795.1	741.6	33	
49	1710	3.7	1.9	0.7	2540	737.9	288.5	16	
49	1810	2.4	1	0.1	280	94.3	17.5	6	
49	1911	4.1	1.7	0.8	3385	968.2	432.2	18	
49	2011	2.5	1.1	0.6	1110	348.2	126.6	9	
49	2111	1.0	0.6	0.5	70	29.5	12.4	1	
49	2211	1.0	0.5	0.4	80	32.7	11.5	1	
49	2311	1.9	0.9	0.8	630	218.0	117.3	4	
49	2411	1.3	0.7	0.8	280	106.2	62.5	2	
49	2511	1.3	0.6	0.7	240 *	91.1	46.3	2	
49	2611	2.3	0.7	0.9	1110	366.3	218.3	5	
49	2711	1.1	0.4	0.5	40.5	18.2	8.1		
49	2811	1.1	0.5	0.8	191.5	75.8	46.6	1	
49	2911	1.0	0.3	0.8	34.5	16.6	12.3		
49	3012	0.8	0.3	0.7	33	15.7	9.9		
49	3112	2.4	0.8	0.8	870	290.2	150.7	5	
49	3212	1.1	0.3	0.7	58	25.8	15.4		
49	3312	0.8	0.2	0.7	15.5	8.0	5.5		
49	3412	1.3	0.4	1	143.5	60.7	53.6		
49	3512	1.0	0.4	0.8	90 *	38.8	25.9		
49	3612	1.7	0.4	1	212	85.8	72.5	1	
49	3712	1.6	0.7	0.9	435	159.6	105.6	2	
50	19	4.5	2.4	0.7	3270	923.2	350.9	21	
50	29	5.0	2.7	0.7	6220	1632.9	577.8	36	
50	39	3.8	2.7	0.4	1895 *	540.9	133.3	21	
50	49	5.6	2.4	0.7	8130	2070.7	711.2	46	
50	59	3.8	2.3	0.7	2420	706.9	277.9	16	
50	610	4.1	1.7	0.7	2420	706.9	277.9	16	
50	710	1.3	0.3	0.5	17	8.4	4.1		
50	810	1.6	0.4	0.4	33 *	14.9	5.8		
50	910	4.4	1.6	0.7	1750	530.3	216.1	12	
50	1011	3.5	1.5	0.8	2140	644.7	302.9	12	
50	1111	1.3	0.7	0.7	143	57.5	31.0	1	
50	1211	2.0	1.3	0.8	680	233.2	124.5	4	
50	1311	1.4	0.5	0.8	191 *	75.6	46.5	1	
50	1411	1.5	0.6	0.7	230	87.7	44.8	2	
50	1511	0.7	0.3	0.9	26	13.1	11.9		
50	1611	0.8	0.4	0.8	41	19.3	14.1		
50	1712	1.4	0.5	0.9	170.8	69.7	51.1	1	
50	1812	0.8	0.1	0.2	7	3.6	1.2		
50	1912	1.0	0.4	0.9	66.5 *	30.2	24.6		
51	18	6.2	3.3	0.6	9120	2254.4	648.4	61	

36	2518	1.2	0.8	0.7	630	214.3	97.8	49.8
36	2618	7.6	4.2	0.9	14325	3539.9	1586.7	549.7
36	2719	7.7	4.2	0.8	15430	3717.6	1401.7	693.2
36	2819	5.5	3.4	0.8	7170	1883.9	773.6	354.4
36	2919	2.1	1.4	0.7	480	168.4	79.2	39.3
36	3019	6.9	4	0.8	13650 *	3334.6	1274.6	622.7
36	3119	0.9	0.7	0.5	62	26.5	11.3	9.1
36	3219	5.7	3.8	0.8	8690	2234.2	898.0	419.4
36	3319	6.8	3.6	0.9	11190	2843.5	1310.1	442.9
36	3420	5.1	3.1	0.8	5000	1368.4	584.9	258.5
36	3520	2.1	1.4	0.7	620	211.3	96.6	49.1
36	3620	4.5	3	0.7	4260	1167.3	430.8	265.5
36	3720	5.0	2.7	0.7	5450	1452.3	521.5	329.4
36	3820	1.3	0.8	0.7	210	80.9	41.7	19.0
36	3920	0.9	0.6	0.6	44	19.9	10.4	5.7
36	4020	0.8	0.5	0.7	37	17.3	10.9	4.2
36	4120	0.9	0.6	0.7	52.5	23.7	14.2	5.7
36	4220	1.0	0.8	0.8	110.5	46.5	30.4	9.2
36	4321	3.0	1.5	0.8	1460	459.3	225.1	88.0
36	4421	1.6	1	0.6	240	89.5	38.6	25.3
36	4521	2.0	1	0.7	570 *	196.1	90.5	45.6
36	4621	2.7	1.6	0.8	770	260.4	137.1	50.3
36	4721	2.5	1.2	0.7	920	299.8	131.2	69.4
36	4821	1.2	0.7	0.6	157	61.4	27.8	17.4
36	4921	1.0	0.6	0.5	99	40.1	16.2	13.8
36	5021	0.9	0.5	0.7	71	30.9	18.0	7.4
36	5121	0.9	0.4	0.6	65	28.1	14.0	8.1
36	5222	2.1	1.2	0.7	570	196.1	90.5	45.6
36	5322	1.5	0.7	0.7	250	94.4	47.8	22.2
36	5422	2.2	1	0.6	570	192.8	75.5	53.9
36	5522	1.2	0.6	0.8	120	50.1	32.4	9.9
36	5622	1.1	0.5	0.9	122.5	51.9	39.5	8.5
36	5722	0.8	0.5	0.8	65.5	29.3	20.3	5.8
36	5822	1.6	0.8	0.8	343	127.1	73.2	24.8
36	5922	2.4	1.2	0.7	810	267.8	118.9	62.1
36	6022	1.4	0.5	0.9	198.5 *	79.6	57.4	13.0
36	6122	1.6	0.9	0.8	287.5	108.7	63.8	21.2
36	6222	1.0	0.5	1	90	40.1	37.3	5.5
37	17	6.6	1.4	0.2	1710	477.4	85.6	275.0
37	27	0.9	0.4	0.7	70	30.5	17.8	7.3
37	39	1.2	0.4	0.8	90	38.8	25.9	7.7
37	411	0.8	0.3	0.6	46	20.7	10.7	6.0
37	512	2.6	1.4	0.8	1210 *	388.8	194.6	74.7
37	612	3.8	2	0.7	1640	500.6	205.5	115.1
37	713	2.2	1.3	0.6	490	168.6	67.1	47.2
37	813	1.7	1.1	0.8	360	132.7	76.0	25.8
37	914	1.0	0.4	0.6	71.5	30.6	15.1	8.8
37	1014	1.3	0.5	0.8	210	82.3	50.0	16.1
37	1114	1.4	0.9	0.7	330	120.8	59.3	28.3
37	1215	2.5	1.2	0.7	920	299.8	131.2	69.4
37	1316	1.1	0.8	0.3	100	39.1	11.4	19.4
37	1416	2.0	1.2	0.6	580	195.8	76.5	54.8
37	1516	1.5	0.7	0.8	200	78.8	48.2	15.4
37	1617	0.9	0.4	0.1	29.5	12.8	3.1	9.3
37	1712	7.2	4.3	0.7	11505	2817.4	931.0	633.5
37	1814	5.6	3.7	0.7	5330	1424.0	512.6	323.0
37	1914	5.1	4	0.5	3710	998.3	269.2	328.4
37	2015	5.4	3.5	0.2	3340 *	864.5	143.9	494.1

51	28	4.8	2.8	0.6	4720	1257.0	389.0	34
51	38	5.4	3.2	0.4	5680 *	1432.0	312.3	56
51	48	4.7	3.2	0.3	4060	1045.4	200.8	49
51	58	4.6	2.9	0.5	4292	1136.0	301.4	37
51	69	4.6	2.3	0.5	3280	895.0	244.6	29
51	79	4.9	2.9	0.7	5970	1574.6	559.7	35
51	89	4.3	2.5	0.5	2810 *	780.2	217.0	25
51	99	4.4	2.1	0.8	5410	1467.5	621.8	27
51	1010	3.0	1.9	0.8	1390	439.7	216.7	8
51	1110	4.4	2	0.9	5260	1455.8	729.5	22
51	1210	6.2	2.6	0.8	1424	449.2	220.8	8
51	1310	4.9	2.3	0.7	6000 *	1581.6	561.9	35
51	1411	2.5	1.3	0.8	1000	328.3	167.9	6
51	1511	1.6	1	0.8	370	135.9	77.6	2
51	1611	2.6	1.4	0.9	1210	395.4	233.4	6
51	1711	0.8	0.3	0.8	52	23.9	16.9	
51	1811	1.0	0.4	0.6	29.5	13.9	7.6	
51	1911	1.6	1.1	0.8	242	93.3	55.9	1
51	2012	1.2	0.4	1	119	51.4	46.3	
51	2112	0.6	0.2	0.9	23.5	12.0	11.0	
51	2212	1.3	0.4	1	180	74.2	63.8	1
51	2312	1.4	0.7	0.9	221.5 *	87.7	62.5	1
51	2412	0.9	0.3	1	49.5	23.6	23.5	
51	2512	1.2	0.7	0.9	137	57.3	43.1	
51	2612	1.4	0.5	0.9	190	76.6	55.5	1
51	2712	1.2	0.4	1	76.5	34.8	32.9	
51	2812	1.6	0.8	0.9	299.5 *	114.6	79.0	1
52	17	7.2	3.9	0.8	12545	3094.1	1193.8	57
52	210	1.9	1	0.6	360	128.3	52.9	3
52	310	3.3	1.4	0.7	1680 *	511.4	209.4	11
52	410	3.7	1.5	0.6	2200	638.7	215.2	17
52	510	1.5	0.7	0.1	140	51.0	10.3	3
52	610	2.0	1	0.3	330	112.9	28.7	5
52	710	3.9	1.5	0.8	4195	1171.1	510.5	22
52	810	4.4	1.7	0.8	5460 *	1479.5	626.2	27
52	911	1.9	0.7	0.9	630	221.7	140.7	3
52	1011	2.8	1.3	0.9	2060	633.9	352.6	10
52	1111	2.3	0.8	0.9	1040	345.8	207.5	5
52	1211	2.3	0.8	0.9	1210	395.4	233.4	6
52	1311	1.4	0.6	0.8	140 *	57.4	36.5	1
52	1411	0.8	0.4	0.9	70	31.6	25.6	
52	1511	0.9	0.4	0.6	60	26.2	13.2	
52	1612	0.9	0.3	0.6	51	22.7	11.6	
52	1712	1.1	0.4	1	129	55.2	49.3	
52	1812	1.2	0.5	0.8	150 *	61.0	38.5	1
52	1912	1.2	0.4	1	154.5	64.8	56.7	
53	19	5.6	2.5	0.7	5310	1419.2	511.1	32
53	29	4.9	3.2	0.7	4110	1130.8	419.0	25
53	310	4.2	2.7	0.7	3600	1005.4	378.1	22
53	410	3.9	2.8	0.5	2010	579.7	167.3	19
53	510	4.6	2.6	0.7	4120 *	1133.2	419.8	25
53	610	8.3	3.8	0.8	23490	5396.7	1941.8	100
53	711	4.7	1.4	0.6	3870	1054.0	333.5	28
53	811	2.0	1	0.5	600	198.4	65.5	6
53	911	5.2	2.7	0.7	6840	1776.5	622.0	40
53	1011	2.7	1.5	0.8	1280	408.7	203.3	7
53	1111	4.6	2.2	0.8	5180	1412.0	601.2	26
53	1211	5.1	2.3	0.5	5480	1410.9	364.2	46

37	2115	6.0	4.7	0.7	8990	2263.8	768.9	510.5
37	2215	5.0	2.5	0.6	2680	760.9	250.8	209.1
37	2316	6.4	3.8	0.7	11390	2792.4	923.7	627.9
37	2416	6.2	3.9	0.4	7190	1765.0	375.0	692.5
37	2516	5.5	3.5	0.3	2680	723.3	145.5	344.9
37	2616	6.3	3.3	0.6	10560	2567.4	726.4	694.4
37	2717	7.2	3.6	0.7	12890	3116.3	1016.8	699.8
37	2818	1.7	1.1	0.5	320	113.6	40.2	38.4
37	2918	1.9	1.4	0.6	580	195.8	76.5	54.8
37	3018	6.3	3.6	0.7	8810	2223.6	756.9	501.5
37	3119	2.3	1.4	0.5	550	183.7	61.2	61.8
37	3219	5.4	3.3	0.8	8330	2151.9	869.0	404.1
37	3319	5.5	3	0.8	8180	2117.5	856.8	397.7
37	3419	5.7	2.9	0.8	8670	2229.6	896.4	418.5
37	3520	2.7	2.2	0.7	1350*	421.3	176.7	97.1
37	3620	4.2	1.9	0.7	3070	873.0	334.2	199.3
37	3720	3.6	1.9	0.8	2720	797.5	364.8	151.7
37	3820	1.7	1.1	0.6	460	159.4	63.9	44.7
37	3920	2.4	1.4	0.8	910	302.0	156.0	58.2
37	4020	2.4	1.5	0.8	1200	386.0	193.4	74.1
37	4120	2.8	1.7	0.8	1920	585.6	278.4	111.8
37	4220	2.3	1.2	0.6	670	222.5	85.6	62.1
37	4321	2.9	1.5	0.8	1900	580.2	276.2	110.8
37	4421	2.8	1.4	0.7	1520	468.0	193.7	107.7
37	4521	1.8	1	0.7	450	159.0	75.4	37.1
37	4621	1.9	1	0.7	595	203.7	93.6	47.4
37	4721	2.1	0.9	0.1	250	85.3	16.1	60.4
37	4821	1.8	0.8	0.8	36	17.2	12.7	3.4
37	4922	1.3	0.4	1	150	63.1	55.4	8.6
37	5022	1.9	0.5	1	190*	77.9	66.6	10.6
37	5122	1.7	0.7	0.9	390	144.9	97.0	23.4
37	5222	1.7	0.7	0.9	380	141.6	95.0	22.9
37	5322	0.9	0.6	0.8	50	23.0	16.4	4.6
37	5422	1.3	0.4	1	190	77.9	66.6	10.6
37	5522	1.0	0.4	1	80	36.2	34.0	5.0
37	5617	3.9	2.8	0.7	3790	1052.3	393.5	239.7
37	5717	5.5	3.6	0.8	6110	1634.7	683.3	308.1
37	5818	5.6	3.2	0.7	7120	1840.9	641.6	416.2
37	5918	3.7	2.9	0.9	2820	837.5	449.8	132.5
37	6018	3.8	2.3	0.8	2430	721.6	334.2	137.4
37	6118	5.3	3.3	0.8	5410	1467.5	621.8	277.0
37	6219	4.8	3.4	0.8	6290	1677.4	698.9	316.0
37	6319	4.1	2.3	0.8	3720	1052.8	465.0	199.5
37	6419	4.0	2.5	0.8	3520	1002.4	445.5	190.1
37	6519	2.8	2	0.6	1460*	444.0	156.6	122.8
37	6619	4.3	2.8	0.8	4580	1266.0	546.4	239.4
37	6719	5.4	3.3	0.8	7610	1986.1	810.2	373.4
37	6820	5.0	2.8	0.9	7060	1890.0	916.6	295.9
37	6920	2.3	1.7	0.8	1080	351.5	178.2	67.6
37	7020	1.4	1.2	0.7	160	63.6	33.8	15.0
37	7120	3.2	1.7	0.8	2000	607.2	287.4	115.9
37	7220	4.3	2	0.8	4200	1172.4	510.9	221.9
37	7320	4.1	1.9	0.9	4840	1352.2	683.9	212.6
37	7421	1.9	1.2	0.6	480	165.5	66.1	46.4
37	7521	3.4	1.5	0.7	2520	732.8	286.7	167.7
37	7621	3.7	1.7	0.8	2660	781.9	358.5	148.8
37	7721	1.9	1.1	0.8	570	199.4	108.6	38.6
37	7822	2.4	0.9	0.9	1340	432.9	252.6	69.1

53	1312	4.9	1.7	0.8	7030	1851.3	761.8	34
53	1412	4.0	2	0.8	3900	1097.8	482.4	20
53	1512	3.5	1.9	0.8	2905*	845.4	383.9	16
53	1612	3.3	1.8	0.9	2150	658.4	364.5	10
53	1712	1.0	0.5	0.6	93.5	38.8	18.6	1
53	1812	0.8	0.4	0.4	23	10.8	4.4	
53	1912	1.1	0.5	0.4	58	24.6	8.9	1
53	2012	1.1	0.5	0.8	134	55.2	35.3	1
53	2112	1.0	0.5	0.6	115.5	46.8	21.9	1
53	2212	4.0	2.2	0.7	3550	993.0	374.0	22
53	2313	3.6	1.2	0.8	3695	1046.5	462.6	19
53	2413	1.0	0.5	0.8	69	30.7	21.1	
53	2513	1.5	0.7	0.6	213*	80.5	35.2	2
53	2613	1.3	0.6	0.9	200	80.1	57.8	1
53	2713	1.2	0.6	0.9	199	79.8	57.6	1
53	2813	1.9	0.9	0.8	661	227.4	121.8	4
53	2913	2.4	1.2	0.6	1550	468.2	164.0	12
53	3013	3.3	1.6	0.8	2600	766.2	352.2	14
53	3113	4.1	1.8	0.9	3800*	1091.1	566.9	17
53	3213	2.0	0.9	0.8	820	275.4	143.9	5
53	3313	2.7	1.4	0.7	1540	473.5	195.7	10
53	3414	1.6	0.5	0.9	295	113.1	78.1	1
53	3514	1.2	0.4	1	120	51.8	46.6	
53	3614	1.3	0.5	1	140	59.4	52.5	
53	3714	1.9	0.5	1	390	147.3	116.3	1
53	3814	1.6	0.6	0.9	320	121.6	83.2	1
53	3914	1.4	0.5	1	140*	59.4	52.5	
54	16	6.7	4.1	0.4	8190	1981.1	414.8	77
54	28	7.6	4.3	0.6	11710	2813.9	787.1	76
54	38	8.8	4.8	0.5	20790	4603.2	1024.5	148
54	49	8.1	3.9	0.6	22190	4960.3	1292.2	133
54	59	6.7	4.4	0.7	15380*	3644.7	1166.0	81
54	69	6.9	4.7	0.7	14545	3468.7	1116.6	77
54	710	8.5	3.9	0.8	27110	6128.2	2170.1	113
54	810	6.6	3.5	0.7	11760	2872.8	946.9	64
54	910	9.1	4.2	0.8	28955	6496.7	2283.8	120
54	1010	4.2	2.4	0.7	3470	973.2	367.5	22
54	1110	6.5	4.2	0.8	14480	3513.9	1334.3	65
54	1210	6.8	4.2	0.8	15310	3691.9	1393.2	68
54	1310	5.8	4.2	0.6	9550	2348.4	672.0	63
54	1411	5.3	3	0.8	6080	1627.6	680.7	30
54	1511	5.4	3.4	0.8	5050*	1380.6	589.4	26
54	1612	2.9	1.8	0.6	1790	532.0	183.4	14
54	1712	4.0	2.1	0.8	3020	875.0	395.6	16
54	1812	5.2	2.8	0.7	6730	1751.2	614.2	39
54	1912	4.4	2	0.6	3820	1042.0	330.1	28
54	2012	1.6	0.9	0.6	340	121.9	50.6	3
54	2112	1.3	0.7	0.4	120	46.8	15.7	1
54	2212	1.7	0.9	0.5	340	119.9	42.2	4
54	2312	1.1	0.6	0.4	70	29.0	10.3	1
54	2412	5.9	2.7	0.7	11300	2772.9	918.1	62
54	2513	1.0	0.4	0.3	41*	17.8	5.7	
54	2613	3.9	1.7	0.8	3730	1055.3	466.0	20
54	2713	3.8	2.1	0.8	3780	1067.8	470.8	20
54	2813	1.4	0.7	0.7	270	101.1	50.7	2
54	2913	3.4	1.8	0.9	3080	905.6	481.7	14
54	3013	1.4	0.6	0.7	205	79.2	41.0	1
54	3113	1.4	0.7	0.6	219.5	82.7	36.0	2

37	7922	1.9	0.5	0.7	230	87.7	44.8	20.6
37	8022	1.1	0.5	0.7	120*	49.2	27.0	11.7
37	8122	2.0	1	0.8	690	236.3	125.9	45.7
37	8222	1.1	0.5	0.8	130	53.8	34.5	10.6
37	8322	1.4	0.6	0.9	270	104.6	72.9	17.0
37	8422	1.4	0.5	1	140	59.4	52.5	8.1
37	8522	1.4	0.5	1	130	55.6	49.6	7.6
38	19	5.9	3.2	0.7	5170	1386.0	500.6	314.5
38	210	7.9	4.8	0.6	19030	4328.5	1147.0	1162.9
38	311	8.5	3.6	0.8	629	217.6	117.2	42.1
38	411	8.1	4.6	0.7	13310	3206.2	1042.4	719.7
38	511	8.9	5.2	0.6	14990*	3502.9	953.2	943.6
38	612	10.0	5.6	0.7	17130	4010.2	1267.7	897.6
38	713	5.4	4.2	0.8	5590	1510.7	637.8	285.0
38	813	5.3	3.2	0.6	3440	949.5	304.4	260.1
38	914	7.7	5	0.5	9540	2306.9	559.9	750.7
38	1014	3.4	2	0.5	1690	497.0	146.3	165.0
38	1114	8.6	4.7	0.8	16725	3993.0	1492.1	743.9
38	1214	5.6	3.3	0.7	3090	878.0	335.8	200.4
38	1314	7.9	5.1	0.8	15410	3713.3	1400.3	692.4
38	1414	6.5	4.8	0.7	9940	2474.8	831.1	557.4
38	1514	6.0	4.6	0.5	7060	1766.3	443.3	576.8
38	1614	3.8	1.2	0.3	980	296.4	66.7	143.0
38	1715	9.9	4	0.7	19950	4590.6	1426.7	1025.7
38	1815	5.7	3.1	0.7	4040	1113.7	413.5	253.4
38	1915	3.9	2.6	0.6	1560	470.9	164.8	130.2
38	2015	7.5	3.7	0.7	8940*	2252.7	765.5	508.0
38	2115	7.5	3.9	0.7	13020	3144.1	1024.7	706.0
38	2216	7.1	3.6	0.6	9380	2311.3	662.7	626.0
38	2316	6.7	4.4	0.7	8340	2118.1	725.4	478.0
38	2416	6.3	4.2	0.8	9170	2343.3	936.2	439.6
38	2516	5.6	3.9	0.9	6000	1636.0	807.9	256.6
38	2616	3.0	1.8	0.6	880	283.4	105.7	78.9
38	2716	3.3	2.2	0.6	1200	373.1	134.5	103.5
38	2817	8.3	4.1	0.7	14460	3450.7	1111.5	773.8
38	2917	6.2	3.8	0.8	7410	1939.8	793.6	364.8
38	3017	3.8	2.5	0.7	2840	814.7	314.6	186.2
38	3117	5.2	2.2	0.6	4435	1189.4	370.7	324.9
38	3217	6.9	4.1	0.7	11430	2801.1	926.2	629.9
38	3317	9.5	4	0.9	20500	4864.5	2095.1	752.4
38	3418	4.5	3.4	0.7	3950	1091.7	406.3	248.5
38	3518	3.2	2.1	0.6	1320*	406.0	144.8	112.5
38	3618	1.6	1.3	0.2	240	83.7	18.7	49.3
38	3718	5.8	3.2	0.7	5360	1431.1	514.8	324.6
38	3818	4.8	2.9	0.7	5070	1362.2	493.1	309.2
38	3918	7.6	4	0.6	12780	3040.8	842.3	820.7
38	4018	5.9	3.6	0.6	7100	1805.5	533.9	490.6
38	4119	2.3	1.5	0.7	870	285.3	125.7	66.1
38	4219	1.3	1.3	0.1	120	44.5	9.1	31.7
38	4319	1.8	1.3	0.6	470	162.5	65.0	45.5
38	4419	6.4	3.1	0.8	9670	2456.3	975.6	460.5
38	4519	1.3	0.9	0.5	200	74.9	27.9	25.5
38	4619	4.2	2.2	0.7	3030	862.9	330.8	197.0
38	4719	4.7	2.6	0.6	3960	1075.8	339.5	294.3
38	4819	4.8	2.5	0.8	4580	1266.0	546.4	239.4
38	4920	2.7	1.8	0.8	1190	383.1	192.1	73.6
38	5020	4.6	2.7	0.8	4850*	1332.0	571.3	251.7
38	5120	4.7	1.8	0.9	4090	1164.6	600.2	183.5

54	3213	1.3	0.6	0.7	152	60.7	32.5	1
54	3313	1.2	0.5	0.8	89.5	38.6	25.8	
54	3413	0.9	0.4	0.9	88.5	38.9	30.7	
54	3513	0.9	0.3	0.8	68.5*	30.5	21.0	
54	3613	1.2	0.6	0.5	93.5	38.2	15.5	1
54	3713	1.5	0.7	0.3	160	59.4	16.3	2
54	3813	5.1	2.3	0.9	6190	1681.9	827.7	26
54	3913	3.2	1.3	0.8	2290	684.6	319.2	13
54	4013	1.3	0.7	0.7	160	63.6	33.8	1
54	4113	1.7	0.8	0.9	340	128.3	87.2	2
54	4213	4.6	1.6	0.7	4850	1309.6	476.4	29
54	4313	1.1	0.4	0.8	150	61.0	38.5	1
54	4413	5.2	2.5	0.8	9990	2528.2	1000.5	47
54	4513	1.2	0.3	0.9	132*	55.4	41.9	
54	4614	1.5	0.8	0.8	190	75.3	46.3	1
54	4714	1.7	0.9	0.8	350	129.4	74.4	2
54	4814	1.0	0.5	0.5	69	29.1	12.2	1
54	4914	1.6	0.3	1	186.5	76.6	65.6	1
54	5014	0.8	0.3	0.9	34.5	16.9	14.8	
54	5114	0.7	0.2	0.9	31.5	15.6	13.8	
54	5214	1.0	0.3	0.9	17.5	9.2	8.7	
54	5314	0.9	0.2	1	61.5	28.6	27.8	
54	5414	1.4	0.6	0.8	272.5	103.6	61.2	2
54	5514	1.6	1	0.7	404.5*	144.7	69.4	3
54	5614	2.1	1.2	0.7	686	231.1	104.5	5
54	5714	1.4	0.7	0.6	206.5	78.4	34.4	2
54	5814	2.1	1	0.8	614	213.0	115.0	4
54	5914	1.8	0.9	0.8	361.5	133.2	76.3	2
54	6014	1.0	0.4	0.9	76	34.0	27.3	
54	6115	1.1	0.2	1	33.5	16.7	17.3	
54	6215	1.5	0.5	1	173.5	71.8	62.0	
54	6315	1.0	0.4	1	85.5	38.4	35.8	
55	18	2.3	1	0.8	900	299.0	154.7	5
55	28	1.7	0.8	0.7	450	159.0	75.4	3
55	39	2.7	1.1	0.8	1340*	425.6	210.7	8
55	49	2.2	0.7	0.7	600	205.2	94.2	4
55	59	1.9	0.6	0.6	295	107.5	45.3	3
55	69	1.4	0.6	0.6	300	109.1	45.9	3
55	79	1.8	0.8	0.6	430*	150.2	60.7	4
55	810	2.0	0.7	0.7	430*	152.7	72.8	3
55	910	1.9	0.8	0.7	400	143.2	68.8	3
55	1010	1.1	0.5	0.8	85.5	37.1	24.9	
56	16	6.6	3.1	0.7	5980	1576.9	560.4	35
56	27	5.3	2.4	0.6	4190	1131.0	354.7	30
56	38	5.8	2.5	0.7	3690	1027.7	385.4	23
56	48	7.1	2.7	0.8	8290	2142.7	865.8	40
56	58	7.5	3.5	0.8	11850*	2941.6	1142.2	55
56	69	3.9	2.6	0.8	2680	787.1	360.6	14
56	79	6.0	2.5	0.7	7310	1884.4	654.9	42
56	89	6.4	2.6	0.8	11390	2840.1	1107.6	53
56	99	5.1	3.2	0.4	4360	1132.6	254.4	44
56	1010	5.5	2.5	0.8	7470	1953.7	798.6	36
56	1110	6.8	2.9	0.8	12740	3136.7	1208.2	58
56	1210	6.2	3.3	0.8	10690	2684.7	1054.5	50
56	1310	5.9	2.7	0.8	10040	2539.5	1004.4	47
56	1410	5.3	2.6	0.9	5930	1619.1	800.6	25
56	1510	2.2	1	0.1	422.5*	135.8	24.1	5
56	1611	4.7	2.5	0.7	5310	1419.2	511.1	32

38	5220	3.8	2.4	0.7	3160	895.6	341.7	204.4
38	5320	2.6	1.7	0.6	930	297.6	110.4	82.8
38	5420	1.9	1.3	0.6	560	189.8	74.5	53.1
38	5520	1.1	0.7	0.5	90	36.9	15.0	12.7
38	5620	1.3	1	0.8	240	92.6	55.5	18.1
38	5720	1.5	1.3	0.1	130	47.8	9.7	34.1
38	5820	1.6	0.9	0.6	290	105.9	44.7	29.8
38	5920	3.4	2.1	0.7	1700	516.8	211.3	118.8
38	6020	4.6	2.75	0.8	4020	1127.7	493.9	213.6
38	6120	5.5	2.7	0.9	6350	1720.4	844.2	269.7
38	6220	3.5	2	0.8	1900	580.2	276.2	110.8
38	6321	3.4	1.6	0.8	2170	652.7	306.2	124.5
38	6421	3.3	1.7	0.7	1850	557.1	225.6	127.9
38	6521	2.9	1.5	0.7	1400 *	435.1	181.7	100.2
38	6621	1.3	1	0.5	120	47.6	18.8	16.3
38	6721	1.5	1.1	0.3	210	75.6	20.2	37.1
38	6821	4.8	2.2	0.8	4230	1179.8	513.8	223.3
38	6921	1.3	0.9	0.7	170	67.1	35.4	15.8
38	7021	1.5	0.7	0.3	60	24.9	7.6	12.4
38	7122	1.7	1	0.7	240	91.1	46.3	21.4
38	7222	0.9	0.7	0.6	60	26.2	13.2	7.5
38	7322	1.1	0.6	1	190	77.9	66.6	10.6
38	7422	1.2	0.6	0.9	110	47.2	36.3	7.7
38	7522	1.7	1	0.8	230	89.2	53.7	17.5
38	7622	2.1	1.1	0.9	840	286.1	175.8	45.9

56	1711	6.0	2.6	0.8	10260	2588.7	1021.4	48
56	1811	5.1	2.1	0.8	6730	1781.0	736.5	33
56	1911	5.0	1.6	0.7	6105	1606.1	569.5	36
56	2011	1.9	1.1	0.9	530	190.2	123.0	3
56	2112	4.1	1.8	0.9	5420	1495.0	746.7	23
56	2212	2.9	1.3	0.8	1520	476.0	232.3	9
56	2312	2.3	1.2	0.8	900	299.0	154.7	5
56	2412	2.4	1.1	0.8	1190	383.1	192.1	7
56	2512	2.3	1.7	0.5	760 *	244.7	78.7	8
56	2612	1.4	0.7	0.8	240	92.6	55.5	1
56	2712	3.9	1.4	0.9	3020	890.0	474.4	14
56	2813	1.9	0.9	0.8	680	233.2	124.5	4
56	2913	2.2	1	0.8	690	236.3	125.9	4
56	3013	3.1	1.3	0.7	1350	421.3	176.7	9
56	3113	2.6	1	0.8	1090	354.4	179.5	6
56	3213	2.0	0.9	0.8	690	236.3	125.9	4
56	3313	1.7	0.7	0.5	240	88.0	32.2	2
56	3413	2.3	0.8	0.9	750	258.7	161.0	4
56	3513	1.6	0.6	0.8	240 *	92.6	55.5	1
56	3613	1.7	0.5	0.9	240	94.2	66.6	1
56	3714	1.3	0.2	1	80.5	36.4	34.2	
56	3814	2.0	0.4	1	224	90.1	75.6	1
56	3914	0.6	0.1	1	25	12.9	13.8	
56	4013	1.0	0.3	0.8	71	31.4	21.6	
56	4111	0.9	0.2	0.5	19	9.3	4.5	

## APPENDIX E

### DEAD AND SMALL LIVE BRANCH DATA

These data represent the weights of all the dead branches and live branches less than 0.6 cm (0.25 inches) in diameter from each sample tree. I abbreviated the parameters in the following way.

Sample tree	ST
Height class of branches (m)	HT
Field weight of dead branches (g)	F.D.
Number of small live branches	N.S.
Field weight of small live branches (g)	F.S.
Field weight of cones from small live branches (g)	F.C.

ST	HT	F.D.	N.S.	F.S.	F.C.
1	0-1	1	0	0	0
1	1-2	9.5	0	0	0
1	2-3	240	0	0	0
1	3-4	730	0	0	0
1	4-5	580	0	0	0
1	5-6	1500	0	0	0
1	6-7	240	0	0	0
1	7-8	770	0	0	0
1	8-9	1990	0	0	0
1	9-10	268.5	4	26	0
1	10-11	260	11	69.5	0
1	11-12	45	19	2001	0
1	12-13	0	12	104	0
1	13-14	250	15	235	0
1	14-15	0	11	61.5	121.5
3	0-1	67.5	0	0	0
3	1-2	332.5	0	0	0
3	2-3	710	0	0	0
3	3-4	1370	0	0	0
3	4-5	2370	0	0	0
3	5-6	10570	0	0	0
3	6-7	1940	0	0	0
3	7-8	670	0	0	0
3	8-9	3610	0	0	0
3	9-10	600	0	0	0
3	10-11	38.5	0	0	0
3	11-12	14.5	1	4.5	0
3	12-13	0	11	6.5	0
3	13-14	17.5	1	26.5	0
4	0-1	0.5	0	0	0
4	1-2	11.5	1	5	0
4	2-3	2.5	0	0	0
4	3-4	14.5	4	35	0
4	4-5	14.5	4	36.5	0
4	5-6	54.5	2	31	0
4	6-7	9	5	49.5	0
8	0-1	0.05	0	0	0
8	1-2	4	0	0	0
8	2-3	28.5	1	1	0
8	3-4	24	0	0	0
8	4-5	10	1	11	0
8	5-6	186.5	0	0	0
8	6-7	47.5	1	12	0
8	7-8	53.5	0	0	0
8	9-10	11	1	1.5	0
8	9-10	0	4	23	0
8	10-11	0	2	7	0
13	0-1	3.5	1	0.3	0
13	1-2	101	0	0	0
13	2-3	174.5	2	4.5	0
13	3-4	380	0	0	0
13	4-5	1000	1	0.5	0

ST	HT	F.D.	N.S.	F.S.	F.C.
37	10-11	1207	3	39.5	0
37	11-12	5442	2	13	0
37	12-13	961.5	4	46.5	0
37	13-14	1896	2	15.5	0
37	14-15	5499.5	15	300	0
37	15-16	2195	1	5.5	0
37	16-17	533	1	0.5	0
37	17-18	136	2	100	0
37	18-19	563	0	0	0
37	19-20	161.5	4	6.5	0
37	20-21	25	12	48	0
37	21-22	3.5	16	181	124
37	22-23	0	17	134.5	476
38	0-1	0	0	0	0
38	1-2	0	0	0	0
38	2-3	0	0	0	0
38	3-4	0	0	0	0
38	4-5	0	0	0	0
38	5-6	55	0	0	0
38	6-7	4880	0	0	0
38	7-8	35	0	0	0
38	8-9	460	0	0	0
38	9-10	960	0	0	0
38	10-11	266.5	0	0	0
38	11-12	0	0	0	0
38	12-13	880	0	0	0
38	13-14	3420	0	0	0
38	14-15	0	0	0	0
38	15-16	95	0	0	0
38	16-17	279.5	0	0	0
38	17-18	300	0	0	0
38	18-19	36	0	0	0
38	19-20	222.5	6	35.5	0
38	20-21	43	5	7	0
38	21-22	68	15	94.5	0
38	22-23	10.5	13	32.5	135.5
38	23-24	0	7	33	117
39	0-1	0	0	0	0
39	1-2	0	2	0.5	0
39	2-3	0	4	2	0
39	3-4	1.5	7	9.5	0
39	4-5	0	2	4	0
39	5-6	0	2	1	0
39	6-7	2440	0	0	0
39	7-8	1	2	1	0
39	8-9	900	3	7.5	0
39	9-10	980	3	0.5	0
39	10-11	1610	2	9.5	0
39	11-12	0	0	0	0
39	12-13	70	3	9	0
39	13-14	390	5	3.5	0
39	14-15	188	3	7.5	0

ST	HT	F.D.	N.S.	F.S.	F.C.
45	13-14	107.5	33	215.5	0
45	14-15	425	12	59	0
45	15-16	600	29	220	0
45	16-17	215	62	280	0
45	17-18	277	30	149	0
45	18-19	151	59	192.5	0
45	19-20	27.5	41	371	0
45	20-21	6	33	429	8
45	21-22	0	1	2	0
46	0-1	0	0	0	0
46	1-2	10	0	0	0
46	2-3	0	0	0	0
46	3-4	213	0	0	0
46	4-5	145	0	0	0
46	5-6	116.5	0	0	0
46	6-7	178.5	0	0	0
46	7-8	141	0	0	0
46	8-9	634	1	1	0
46	9-10	7560	1	4	0
46	10-11	3150	0	0	0
46	11-12	1730	0	0	0
46	12-13	5370	0	0	0
46	13-14	650	1	5	0
46	14-15	1800	0	0	0
46	15-16	1700	0	0	0
46	16-17	1520	0	0	0
46	17-18	500	1	1	0
46	18-19	0	2	10.5	0
46	19-20	4	2	11.5	0
46	20-21	29	2	8.5	0
46	21-22	0	5	23.5	55
47	0-1	0	0	0	0
47	1-2	1170	1	1.5	0
47	2-3	0	2	0.5	0
47	3-4	4.5	2	1	0
47	4-5	6	4	3	0
47	5-6	25	10	8.5	0
47	6-7	228.5	2	1	0
47	7-8	6.5	6	8	0
47	8-9	390	6	10.5	0
47	9-10	27.5	13	19	0
47	10-11	139.5	6	13.5	0
47	11-12	176.5	10	17	0
47	12-13	415	16	20	0
47	13-14	655	20	31.5	0
47	14-15	35.5	26	67.5	0
47	15-16	151.5	38	85	0
47	16-17	53	110	420	0
47	17-18	1.5	34	369	29.5
49	0-1	12	0	0	0
49	1-2	98.5	0	0	0
49	2-3	690	0	0	0

13	5-6	750	1	0.5	0
13	6-7	1610	3	1.5	0
13	7-8	3220	6	7	0
13	8-9	180	2	4.5	0
13	9-10	80	14	17	0
13	10-11	12	7	19	0
13	11-12	0	7	44	0
15	0-1	174	0	0	0
15	1-2	517	0	0	0
15	2-3	160	0	0	0
15	3-4	895	0	0	0
15	4-5	3010	0	0	0
15	5-6	3040	0	0	0
15	6-7	660	0	0	0
15	7-8	95.5	0	0	0
15	8-9	35.5	2	7.5	0
15	9-10	12.5	4	27.5	0
15	10-11	7	2	3.5	0
15	11-12	0	14	83	0
15	12-13	0	5	54.5	0
19	0-1	4	0	0	0
19	1-2	5.5	0	0	0
19	2-3	25.5	0	0	0
19	3-4	71.5	1	7	0
19	4-5	25.5	1	4.5	0
19	5-6	333	0	0	0
19	6-7	81.5	1	6	0
19	7-8	316	0	0	0
19	8-9	329	2	7	0
19	9-10	46	10	45	0
19	10-11	17.5	15	150.5	0
19	11-12	0	6	98	0
19	12-13	0	10	69	0
21	0-1	12	0	0	0
21	1-2	85.5	0	0	0
21	2-3	331.5	0	0	0
21	3-4	414.5	0	0	0
21	4-5	2720	0	0	0
21	5-6	1130	0	0	0
21	6-7	1.5	0	0	0
21	7-8	33	0	0	0
21	8-9	80	0	0	0
21	9-10	16.5	11	80.5	0
21	10-11	57	8	54.5	0
21	11-12	31	14	171.5	0
21	12-13	31.5	7	66	0
21	13-14	0	22	45	0
21	14-15	0	1	1	162
27	0-1	0.05	1	1	0
27	1-2	10	3	8	0
27	2-3	26	24	90	0
27	3-4	5.5	27	178	0
31	0-1	0.05	1	0.5	0
31	1-2	4	6	4	0

39	15-16	230	4	10.5	0
39	16-17	0	2	4	0
39	17-18	23.5	2	2.5	0
39	18-19	85	26	166	0
39	19-20	33.5	16	69	0
39	20-21	9	27	162.5	0
39	21-22	3.5	26	213.5	0
39	22-23	0	2	9	0
40	0-1	0	0	0	0
40	1-2	8.5	13	5	0
40	2-3	38	15	5	0
40	3-4	0	11	5.5	0
40	4-5	63	17	14.5	0
40	5-6	950	17	11.5	0
40	6-7	9	5	14.5	0
40	7-8	114.5	9	12.5	0
40	8-9	160.5	6	14	0
40	9-10	2990	14	45	0
40	10-11	4460	7	5.5	0
40	11-12	2190	14	35.5	0
40	12-13	29	7	28	0
40	13-14	80	10	59.5	0
40	14-15	91	14	113.5	0
40	15-16	81	18	168	0
40	16-17	220	7	10.5	0
40	17-18	51	10	136.5	0
40	18-19	115	18	77.5	0
40	19-20	3	12	163	0
40	20-21	0	12	109	180
41	0-1	308.5	0	0	0
41	1-2	0	2	1	0
41	2-3	0	3	2.5	0
41	3-4	22	12	30	0
41	4-5	85	21	87.5	0
41	5-6	8.5	25	360	0
41	6-7	24	17	115	0
41	7-8	290	20	140	0
41	8-9	675	13	35	0
41	9-10	830	20	80	0
41	10-11	60	16	52.5	0
41	11-12	16.5	18	99.5	0
41	12-13	14.5	27	232.5	40.5
41	13-14	1	10	195.5	30
42	0-1	0	0	0	0
42	1-2	0	3	0.5	0
42	2-3	0	6	0.5	0
42	3-4	0	8	2	0
42	4-5	0	0	0	0
42	5-6	1.5	1	0.5	0
42	6-7	0	2	0.5	0
42	7-8	16	3	0.5	0
42	8-9	83.5	2	1	0
42	9-10	240	0	0	0
42	10-11	214	0	0	0

49	3-4	190	0	0	0
49	4-5	2050	0	0	0
49	5-6	4810	0	0	0
49	6-7	7170	1	1	0
49	7-8	270	2	0.5	0
49	8-9	110	2	2	0
49	9-10	123	3	22.5	0
49	10-11	249	8	17	0
49	11-12	33	22	91	0
49	12-13	0	14	123	0
50	0-1	13.5	0	0	0
50	1-2	130	0	0	0
50	2-3	280	0	0	0
50	3-4	170	0	0	0
50	4-5	90	0	0	0
50	5-6	840	0	0	0
50	6-7	1510	0	0	0
50	7-8	1890	0	0	0
50	8-9	2160	1	0.5	0
50	9-10	520	0	0	0
50	10-11	230	4	9.5	0
50	11-12	7	14	40.5	0
50	12-13	0	1	2	0
51	0-1	5	0	0	0
51	1-2	780	0	0	0
51	2-3	730	0	0	0
51	3-4	640	0	0	0
51	4-5	640	0	0	0
51	5-6	2290	0	0	0
51	6-7	800	0	0	0
51	7-8	1830	0	0	0
51	8-9	580	0	0	0
51	9-10	1180	0	0	0
51	10-11	490	0	0	0
51	11-12	11.5	13	52.5	0
51	12-13	0	16	40	0
52	0-1	0	0	0	0
52	1-2	7.5	1	1	0
52	2-3	139	1	1.5	0
52	3-4	299.5	0	0	0
52	4-5	350	4	16	0
52	5-6	540	17	77.5	0
52	6-7	1428	23	62.5	0
52	7-8	1520	17	122	0
52	8-9	2070	72	837.5	0
52	9-10	720	100	405	0
52	10-11	1170	53	139.5	0
52	11-12	50.5	31	216	0
52	12-13	3	7	82	0
53	0-1	0	0	0	0
53	1-2	0.5	3	1.5	0
53	2-3	5	2	2.5	0
53	3-4	50	1	0.05	0
53	4-5	500	3	1	0

31	2-3	13	24	75	0
31	3-4	14	21	106.5	0
31	4-5	19.5	6	20.5	0
31	5-6	67	13	98	0
31	6-7	22	9	92	0
31	7-8	29.5	24	182	0
31	8-9	3.5	9	101	0
35	0-1	0.5	0	0	0
35	1-2	131	0	0	0
35	2-3	75	0	0	0
35	3-4	50	0	0	0
35	4-5	400	0	0	0
35	5-6	280	0	0	0
35	6-7	1960	0	0	0
35	7-8	1850	0	0	0
35	8-9	140	0	0	0
35	9-10	0	0	0	0
35	10-11	62	2	0.5	0
35	11-12	0	6	25	0
36	0-1	0	0	0	0
36	1-2	6.5	0	0	0
36	2-3	420.5	0	0	0
36	3-4	204	0	0	0
36	4-5	211	0	0	0
36	5-6	443.5	0	0	0
36	6-7	740	0	0	0
36	7-8	521.5	0	0	0
36	8-9	3560	0	0	0
36	9-10	2520	0	0	0
36	10-11	1550	0	0	0
36	11-12	3910	0	0	0
36	12-13	5810	0	0	0
36	13-14	1100	0	0	0
36	14-15	2000	0	0	0
36	15-16	240	0	0	0
36	16-17	200	0	0	0
36	17-18	2780	0	0	0
36	18-19	103.5	0	0	0
36	19-20	322	7	130	0
36	20-21	18	18	105	0
36	21-22	11	19	160.5	0
36	22-23	0	10	42.5	27.5
37	0-1	0	0	0	0
37	1-2	0	0	0	0
37	2-3	5.5	0	0	0
37	3-4	0	0	0	0
37	4-5	31	0	0	0
37	5-6	3	0	0	0
37	6-7	24	8	141	0
37	7-8	302.5	6	88	0
37	8-9	1337.5	6	43.5	0
37	9-10	42.5	7	136.5	0

42	11-12	491.5	0	0	0
42	12-13	2660	0	0	0
42	13-14	360	2	14	0
42	14-15	800	2	6	0
42	15-16	140	4	7.5	0
42	16-17	37	1	2	0
42	17-18	70.5	16	195.5	0
42	18-19	1	12	145	0
42	19-20	0	16	182.5	0
43	0-1	0	0	0	0
43	1-2	1.5	0	0	0
43	2-3	30.5	1	1.5	0
43	3-4	7	0	0	0
43	4-5	18	5	3	0
43	5-6	38	2	1.5	0
43	6-7	3.5	3	23	0
43	7-8	52.5	4	58	0
43	8-9	810	26	200	0
43	9-10	580	30	345	0
43	10-11	35	11	100	0
43	11-12	43.5	29	220	0
44	0-1	0	0	0	0
44	1-2	0	4	2.5	0
44	2-3	0	7	8	0
44	3-4	99.5	15	29	0
44	4-5	10	11	30.5	0
44	5-6	27	16	108	0
44	6-7	169	25	172	0
44	7-8	71	43	299	0
44	8-9	581	58	407	0
44	9-10	4.5	32	277	0
44	10-11	15.5	27	167.5	0
44	11-12	30.5	33	297.5	0
44	12-13	58.1	14	98	0
44	13-14	115.5	37	445.5	0
44	14-15	157	20	361	0
44	15-16	24.5	10	74	0
44	16-17	10	17	228.5	0
44	17-18	0	1	13.5	0
45	0-1	0	0	0	0
45	1-2	0	0	0	0
45	2-3	4	0	0	0
45	3-4	9	1	0.5	0
45	4-5	2	0	0	0
45	5-6	0.5	0	0	0
45	6-7	13	0	0	0
45	7-8	30	1	1.5	0
45	8-9	104.5	0	0	0
45	9-10	31.5	14	43.5	0
45	10-11	122	24	110.5	0
45	11-12	41.5	42	329.5	0
45	12-13	145	24	244.5	0

53	5-6	3640	2	4.5	0
53	6-7	2280	3	7.5	0
53	7-8	4450	0	0	0
53	8-9	9550	5	34.5	0
53	9-10	1550	8	41.5	0
53	10-11	2100	5	20	0
53	11-12	490	4	9	0
53	12-13	41	5	13	0
53	13-14	114	7	81.5	0
53	14-15	0	4	0	127
54	0-1	0	0	0	0
54	1-2	1.5	0	0	0
54	2-3	134.5	0	0	0
54	3-4	253	0	0	0
54	4-5	1070	0	0	0
54	5-6	1160	0	0	0
54	6-7	8200	0	0	0
54	7-8	6400	0	0	0
54	8-9	5970	0	0	0
54	9-10	5610	0	0	0
54	10-11	1440	0	0	0
54	11-12	2395	0	0	0
54	12-13	640	0	0	0
54	13-14	23	3	3	15.5
54	14-15	6.5	30	215	141
55	0-1	0	0	0	0
55	1-2	56.5	0	0	0
55	2-3	209	0	0	0
55	3-4	130.5	0	0	0
55	4-5	270	0	0	0
55	5-6	1800	0	0	0
55	6-7	290	2	3	0
55	7-8	430	4	6	0
55	8-9	500	4	14.5	0
55	9-10	100	2	7.5	0
55	10-11	22	0	0	0
56	0-1	0	0	0	0
56	1-2	56	1	3.5	0
56	2-3	128.5	0	0	0
56	3-4	1140	0	0	0
56	4-5	1620	4	7	0
56	5-6	2130	3	5.5	0
56	6-7	8280	1	0.5	0
56	7-8	3270	7	16.5	0
56	8-9	2190	3	2	0
56	9-10	870	20	76	0
56	10-11	230	15	44	0
56	11-12	470	26	112.5	27.5
56	12-13	62.5	10	39.5	0
56	13-14	0	33	187.5	31.5
56	14-15	0	5	14	27

## **APPENDIX F**

### **LARGE SORTED BRANCH DATA**

These data are the field and dry weights of the 133 sub sample large branches.

The column headings are self-explanatory.

tree	Sort Branch #	field weights (g)									unadjusted 2003_needles	% increase 2003_needle ratio	adjusted 2003_needles	2002
		2003_needles	2002_needles	live_0 1/4	live_>1/4	dead_0 1/4	dead>1/4	dead_needles	dead_cones	live_cones				
1	5	38	120.5	95.5	787	60	58	0	0		13.1	0.5	28.8	
1	15	123	301	191.5	1035	34.5	0	0	12		42.4	0.5	93.3	1
1	25	14	34	27	49	2.5	0	0	0		4.8	0.5	10.6	
1	35	237	92	86.5	327.5	0	0	0	0		81.6	0.5	179.7	
1	45	137.5	295.5	153	632	0.05	0	0	0		47.3	0.5	104.3	1
1	55	59.5	180	53.5	230.5	0	0	0	0		20.5	0.5	45.1	
1	65	7	6.5	3.5	0	0	0	0	0		2.4	0.5	5.3	
1	75	97	99.5	0	170	0	0	0	0	79.5	33.4	0.5	73.6	
1	85	28	37	4	25.5	0	0	0	0		9.6	0.5	21.2	
3	5	24.5	121.5	68	962	23.5	81.5	0	0		8.4	0.5	17.5	
3	15	99	289.5	121	1014	28.5	16	0	0		34.1	0.5	70.6	1
3	26	52.5	137	17.5	147.5	0	0	0	0		18.1	0.5	37.4	
3	30	82	280.5	75.5	373	0	0	0	0		28.2	0.5	58.5	1
3	35	34.5	35	9.5	36	0	0	0	0		11.9	0.5	24.6	
4	3	1.5	10.5	17.5	8.5	0	0	1	0		0.5	0.5	1.1	
4	6	12	68.5	102	198	12	5.1	0	0		4.1	0.5	8.7	
4	9	5	26	54.5	48.5	10	0	0.5	0		1.7	0.5	3.6	
8	3	3	15.5	16	39	3	0	0	0		1.0	0.5	2.2	
8	10	33	80.5	50.5	120.5	0	0	0	0		11.4	0.5	23.9	
8	17	26.5	45	18.5	47	0	0	0	0		9.1	0.5	19.2	
8	23	33	12	10	21.5	0	0	0	0		11.4	0.5	23.9	
13	5	16.5	33.5	65.5	174.5	14	0	0	0		5.7	0.7	8.1	
13	15	39.5	79	63	112.5	0.05	0	0	0		13.6	0.7	19.3	
13	25	36	48.5	19	36.5	0	0	0	0		12.4	0.7	17.6	
13	35	26	27.5	7	9	0	0	0	0		9.0	0.7	12.7	
13	45	74	37.5	16.5	26.5	0	0	0	0		25.5	0.7	36.2	
15	5	78.5	144.5	192.5	1075.5	31	17	0	0		27.0	0.5	56.9	
15	15	74.5	185.5	157	962.5	9.5	0.5	0	0		25.7	0.5	54.0	
15	25	38.5	107.5	49	139	0	0	0	0		13.3	0.5	27.9	
15	35	12.5	14	11.5	6	0	0	0	0		4.3	0.5	9.1	
15	45	29	43	5	30.5	0	0	0	0		10.0	0.5	21.0	
19	5	38.5	140	89.5	188	4	0	0	0		13.3	0.5	27.9	
19	15	11.5	42	50.5	53.5	3.5	0	0	0		4.0	0.5	8.3	
19	25	27	28	26	37	0	0	0	0		9.3	0.5	19.6	
19	35	12	15.5	5.5	7	0	0	0	0		4.1	0.5	8.7	
21	5	62.5	140.5	151	1240	22	10.5	0	0		21.5	0.6	37.4	
21	15	3.5	24	30.5	30	6.5	2	0	0		1.2	0.6	2.1	
21	25	293.5	415	283.5	1660	19.5	9	0	13.5		101.1	0.6	175.6	1
21	35	15	44.5	43	40	2.5	0	0	0		5.2	0.6	9.0	
21	43	56	82	52	80.5	0	0	0	0		19.3	0.6	33.5	
21	55	6.5	23.5	5.5	9.5	0	0	0	0		2.2	0.6	3.9	
27	2	3.5	16.5	12.5	3	0	0	0	0		1.2	0.5	2.5	
27	4	3	7	9	0.5	0	0	0	0		1.0	0.5	2.2	
31	3	11	27	27.5	31.5	5.5	2	0	0		3.8	0.5	8.0	
31	10	11	23.5	26.5	22.5	0.5	0	0	0		3.8	0.5	8.0	
31	14	7.5	18.5	20.5	40	1.5	3.5	0	0		2.6	0.5	5.4	
35	5	29.5	51	51.5	129.5	18.5	0	0	0		10.2	0.7	14.4	
35	15	14	22.5	24	43.5	0.3	0	0	0		4.8	0.7	6.8	
35	25	71	123.5	64	258.5	8.5	0	0	0		24.4	0.7	34.7	
35	35	29	62.5	19.5	65.5	1	0	0	0		10.0	0.7	14.2	
35	45	116	199.5	60.5	345.5	0	0	0	0		39.9	0.7	56.7	
36	5	745.5	1372	1143.5	11494	297.5	410	4.5	0	0	289.2	1.0	289.2	6
36	17	1778	2779	1962.5	18349	152	146.5	0	182	0	689.4	1.0	689.4	1
36	30	1299	1977	909.5	8558.5	45	9.5	2.5	343.5	0	503.8	1.0	503.8	9

36	45	119	180	60	198	0	0	0	0	0	46.2	1.0	46.2	
36	60	101	19.5	12	61.5	0	0	0	0	0	39.2	1.0	39.2	
37	5	233.5	233.5	200.5	416	48.5	43	0	12	0	90.6	1.0	90.6	1
37	20	47.5	135.5	109.5	922	190	1720	0	29	0	18.4	1.0	18.4	
37	35	181	173	70.5	686	14.5	20.5	0	120.5	0	70.2	1.0	70.2	
37	50	85.5	45.5	0	56	1	0	5.5	0	0	33.2	1.0	33.2	
37	65	218	350	180.5	608.5	11.5	0	0	14	0	84.6	1.0	84.6	1
37	80	40.5	28	9.5	17	0	0	0	35.5	0	15.7	1.0	15.7	
38	5	446	597.5	497	12107.5	233	695	4	10	0	173.0	1.0	173.0	2
38	20	311.5	468	328.5	6537.5	275	850	3	18.5	0	120.8	1.0	120.8	2
38	35	158.5	215.5	170.5	689.5	39.5	31.5	1.5	0	0	61.5	1.0	61.5	1
38	50	757	724.5	285.5	2843	19.5	10	1	152	0	293.6	1.0	293.6	3
38	65	267	239	125	702.5	14	0	0	0	0	103.6	1.0	103.6	1
38	80	111.5	25	8.5	45.5	0	0	0	0	0	43.2	1.0	43.2	
39	5	304.5	417	289.5	2539.5	94	43	1.5	0	0	118.1	0.9	130.8	1
39	15	1001	1624	833	5330	143.5	53	1	256	0	388.1	0.9	429.6	7
39	25	113.5	216	122	234	7.5	0	0	9	0	44.0	0.9	48.7	1
39	35	162.5	377.5	166	496.5	4.5	0	0	25.5	0	63.0	0.9	69.8	1
39	45	69	74	29.5	176.5	1	0	0	145	0	26.8	0.9	29.6	
39	55	21	22	7	17.5	0	0	0	0	0	8.1	0.9	9.0	
39	65	68	80	18	45	0	0	0	26	0	26.4	0.9	29.2	
40	6	316.5	363.5	468.5	2166.5	184.5	78.5	24.5	0	0	122.8	1.0	122.8	1
40	20	567.5	544.5	436	1567	53	42	0	88	0	220.1	1.0	220.1	2
40	35	260.5	255	97.5	395.5	0	0	0	120	0	101.0	1.0	101.0	1
40	49	157.5	69.5	20.5	109	0	0	0	54.5	0	61.1	1.0	61.1	
41	5	4.5	10	15.5	18.5	28	14.5	0	0	0	1.7	1.0	1.7	
42	5	159.5	176.5	221.5	1536	122.5	90	1	0	0	61.9	1.0	61.9	
42	20	504.5	403.5	220	1144	1	0	0	15.5	0	195.7	1.0	195.7	1
42	35	210	130	35	190.5	0	0	0	13	0	81.5	1.0	81.5	
43	5	102.5	172	122.5	142	11	0	1	0	0	39.8	1.0	39.8	
44	5	159	301.5	293.5	1297.5	91.5	19	0	0	0	61.7	1.0	61.7	1
44	20	86	158	105	307.5	21.5	55	1	0	0	33.4	1.0	33.4	
45	5	52.5	61	70	157.5	31.5	12.5	0	0	0	20.4	1.0	20.4	
45	15	429	335.5	219.5	785	23.5	0	0	23.5	0	166.4	1.0	166.4	1
45	35	60.5	23.5	9	13.5	0	0	0	0	0	23.5	1.0	23.5	
45	50	11.5	10	10.5	11	1	0	0	4.5	0	4.5	1.0	4.5	
45	65	215	161	62.5	136.5	0	0	0	0	0	83.4	1.0	83.4	
46	5	593	666	485	7376.5	117	140	3	19	0	230.0	1.0	230.0	3
46	20	31.5	49.5	64	184.5	29	2	0	11	0	12.2	1.0	12.2	
46	35	95.5	78.5	57.5	134.5	13.5	7	0	0	0	37.0	1.0	37.0	
46	50	14.5	10.5	16.5	38	3	0	0	2.5	0	5.6	1.0	5.6	
47	5	151	116.5	125.5	544.5	39.5	23	0	5.5	0	58.6	1.0	58.6	
47	20	52.5	18.5	13.5	30	0	0	0	0	0	20.4	1.0	20.4	
49	5	324.5	462.5	197.5	4054.5	284	461	51	17.5	0	119.5	0.8	147.6	2
49	14	980.5	1007	478.5	4533.5	193	360	13	0	0	361.0	0.8	445.9	4
49	15	398.5	391.5	152	857.5	27.5	48.5	2.5	5.5	0	146.7	0.8	181.2	1
49	25	86.5	61	27	61	1.5	0	1.5	0	0	31.9	0.8	39.3	
49	35	35.5	35	10	14	0	0	0	0	0	13.1	0.8	16.1	
50	3	81	74	33.5	1220	69	380	0	0	0	29.8	0.8	36.9	
50	8	5	7.5	3	7	6	4	0	0	0	1.8	0.8	2.3	
50	13	64	48	13	58.5	0	0	0	0	0	23.6	0.8	29.2	
50	19	25.5	15	0	18.5	0	0	0	0	0	9.4	0.8	11.6	
51	3	249	370	102	4120	128.5	596	4	53.5	0	91.7	0.8	113.4	1
51	8	212	266	88.5	1950	66.5	151.5	15.5	34.5	0	78.1	0.8	96.6	1
51	13	938.5	994	325	3330	81.5	229	7.5	21.5	29	345.6	0.8	427.6	4
51	23	63.5	72	16	64.5	0	0	0	0	0	23.4	0.8	28.9	
51	28	91.5	85	28.5	91	0	0	0	0	0	33.7	0.8	41.7	
52	3	207.5	271.5	97	841.5	78.5	128	2.5	12	33	76.4	0.8	94.4	1

52	8	888	1183	368	2386	138.5	179	10	63	69.5	327.0	0.8	403.9	5
52	13	27.5	61	14.5	35.5	0.5	0	0	0	0	10.1	0.8	12.5	
52	18	33.5	62.5	11.5	33.5	0	0	2.5	0	0	12.3	0.8	15.2	
53	5	277.5	404.5	187.5	2233.5	133	336.5	0	380	0	102.2	0.8	124.4	1
53	15	348	460	135	1257	15	21.5	0	433	192	128.1	0.8	156.1	2
53	25	21	42	22.5	57.5	0	0	0	62	0	7.7	0.8	9.4	
53	31	579	741.5	173	1354	3.5	0	0	362.5	410	213.2	0.8	259.7	3
53	39	50.3	45	4	56.5	0	0	0	0	3	18.5	0.8	22.6	
54	5	1086	1619	561.5	10291	310	1000	2	88	25.5	399.7	0.7	534.8	7
54	15	919	1471	390	5770	130	340	0	250	7	338.4	0.7	452.8	6
54	25	8	13.5	13.5	7	0	0	0	0	0	2.9	0.7	3.9	
54	35	15	33	4.5	14	0	0	0	0	0	5.5	0.7	7.4	
54	45	51	42.5	3	26.5	0	0	0	0	0.5	18.8	0.7	25.1	
54	55	93.5	95	17.5	142	0	0	0	43	0.5	34.4	0.7	46.1	
55	3	251.5	328	120	560	1	2.5	0	32.5	0	92.6	0.8	114.6	1
55	7	65.5	109.5	57.5	168	2	11.5	0	0	0	24.1	0.8	29.8	
55	8	88.5	83	45	170	15	0	0	19	0	32.6	0.8	40.3	
56	5	700.5	1225	448	7880	169.5	692	33.5	36	0	257.9	0.7	348.8	5
56	15	5	24	7	117	55	212.5	2	0	0	1.8	0.7	2.5	
56	25	67.5	153.5	56	331.5	15.5	15	2.5	0	0	24.9	0.7	33.6	
56	35	42.5	95.5	22	68	0	0	0.05	0	0	15.6	0.7	21.2	

## **APPENDIX G**

### **DEAD AND SMALL LIVE SORTED BRANCH DATA**

These data are the field and dry weights of the dead and small live branches. Also included are the adjustment factors for field to dry weights and the component factor ratios. The column headings are self-explanatory.

tree	field weights (g)			ratio of green components of small branches			field weight live total (g)			green:dry ratios			dry weight (g)			ac : ne
	dead branches	weight of little live branches	cones from little live	2002 needles	2003 needles	0-1/4 live branch	2002 needles	2003 needles	0-1/4 live branch	2002 needles	2003 needles	0-1/4 live branch	unadjusted 2003 needles	adjustment factor 2003 needles	2002 needles	
1	6884	2497	121.5	0.46	0.25	0.29	1144.0	624.3	728.7	0.48	0.34	0.54	212.2	0.5	549.1	
3	22310.5	37.5	0	0.66	0.13	0.21	24.6	4.8	8.0	0.48	0.34	0.54	1.6	0.5	11.8	
4	107	157	0	0.42	0.17	0.42	65.3	26.3	65.3	0.48	0.34	0.54	8.9	0.5	31.4	
8	365.05	55.5	0	0.46	0.32	0.22	25.4	17.6	12.4	0.48	0.34	0.54	6.0	0.5	12.2	
13	7511	98.8	0	0.43	0.34	0.23	42.2	33.5	23.1	0.48	0.34	0.54	11.4	0.7	20.2	
15	8606.5	176	0	0.38	0.34	0.28	66.7	60.4	48.9	0.48	0.34	0.54	20.5	0.5	32.0	
19	1255	387	0	0.45	0.24	0.31	175.7	93.2	118.1	0.48	0.34	0.54	31.7	0.5	84.3	
21	4944	418.5	162	0.45	0.29	0.26	186.2	121.5	110.7	0.48	0.34	0.54	41.3	0.6	89.4	
27	41.55	277	0	0.42	0.20	0.38	115.5	55.9	105.6	0.48	0.34	0.54	19.0	0.5	55.4	
31	172.55	679.5	0	0.41	0.22	0.37	276.9	148.5	254.1	0.48	0.34	0.54	50.5	0.5	132.9	
35	4948.5	25.5	0	0.43	0.36	0.21	10.9	9.1	5.5	0.48	0.34	0.54	3.1	0.7	5.2	
36	26671.5	438	27.5	0.09	0.81	0.09	41.5	355.9	40.6	0.39	0.47	0.55	167.4	1.0	16.1	
37	20369	1299.5	600	0.33	0.40	0.26	433.2	523.0	343.4	0.39	0.47	0.55	245.9	1.0	168.0	
38	12011	202.5	252.5	0.29	0.28	0.43	58.6	56.1	87.8	0.39	0.47	0.55	26.4	1.0	22.7	
39	6965	692.5	0	0.40	0.30	0.30	276.8	208.8	206.9	0.39	0.47	0.55	98.2	0.9	107.4	
40	11653.5	1034	180	0.33	0.43	0.24	340.5	446.9	246.6	0.39	0.47	0.55	210.2	1.0	132.1	
41	2335	1431	70.5	0.34	0.31	0.35	489.1	447.1	494.8	0.39	0.47	0.55	210.2	1.0	189.7	
42	5115	558	0	0.26	0.41	0.33	143.8	228.7	185.4	0.39	0.47	0.55	107.6	1.0	55.8	
43	1619.5	952	0	0.13	0.76	0.11	123.7	723.2	105.2	0.39	0.47	0.55	340.0	1.0	48.0	
44	1373.1	3018.5	0	0.36	0.27	0.37	1076.4	819.8	1122.3	0.39	0.47	0.55	385.5	1.0	417.5	
45	2312	2648	8	0.36	0.40	0.24	941.0	1066.9	640.1	0.39	0.47	0.55	501.6	1.0	365.0	
46	25451	65	55	0.26	0.56	0.18	16.8	36.7	11.5	0.39	0.47	0.55	17.3	1.0	6.5	
47	3485.5	1076.5	29.5	0.21	0.47	0.32	225.8	506.3	344.4	0.39	0.47	0.55	238.0	1.0	87.6	
49	15805.5	257	0	0.37	0.44	0.19	94.5	112.6	49.9	0.37	0.47	0.55	52.8	0.8	34.8	
50	7840.5	52.5	0	0.39	0.41	0.20	20.6	21.6	10.3	0.37	0.47	0.55	10.1	0.8	7.6	
51	9976.5	92.5	0	0.54	0.29	0.17	49.8	27.2	15.4	0.37	0.47	0.55	12.8	0.8	18.4	
52	8297.5	1960.5	0	0.45	0.29	0.25	890.7	572.2	497.6	0.37	0.47	0.55	268.4	0.7	328.0	
53	24770.5	216.55	127	0.42	0.17	0.41	90.6	37.7	88.3	0.37	0.47	0.55	17.7	0.8	33.4	
54	33303.5	218	156.5	0.41	0.40	0.19	89.8	87.7	40.5	0.37	0.47	0.55	41.1	0.7	33.1	
55	3808	31	0	0.44	0.32	0.25	13.6	9.8	7.6	0.37	0.47	0.55	4.6	0.8	5.0	
56	20447	508.5	86	0.47	0.36	0.17	239.9	181.8	86.9	0.37	0.47	0.55	85.2	0.7	88.3	

## APPENDIX H

### MONTAGUE INVENTORY DATA

These data are the fixed radius inventory plots from MPWMA that I collected to demonstrate the ability of my pitch pine equation to calculate CBD and Crowning Index. These data represent 12 each 0.1 acre fixed radius plots in the thinned and control areas. I started with two plots from the thinned area and three plots from the control area previously sampled by Glenn Motzkin from the Harvard Forest. Using a stratified random technique, I chose and sampled 12 others in the thinned area and 9 others in the control area. For the same trees that I sampled, I calculated available canopy fuel with both the pitch pine equations from this study and Brown's (1978) white bark pine equation. I abbreviated the parameters in the following way:

Treatment	TR
Control	co
Thinned	th
Plot	PL
Motzkin plot	m_
DBH(cm)	DB
Crown Base Height(m)	CB
Tree height (m)	HT
Crown Class	CC
Dominant	d
codominant	c
intermediate	i
Suppressed	s
Crown depth (m)	CD
Foliage weight (g)	FW
< 0.25" branches (g)	BW
Available Fuel	AF
Available Fuel per Meter	AFM
No trees in plot	nt

Table H.1 Table shows the thinned and un-thinned plots and associated CBD values calculated with the pitch pine and white bark pine equations. The bold values represent the plots with the highest CBD for each of the thinned and un-thinned stands.

Thinned			Un-thinned		
plot	pitch pine cbd	white bark pine cbd	plot	pitch pine cbd	white bark pine cbd
m12	0.0036	0.0082	m101	0.099	0.118
m5	0.0155	0.0137	m45	0.087	0.087
1	0.0159	0.0175	m120	0.101	0.106
<b>2</b>	<b>0.0303</b>	<b>0.0353</b>	1	0.067	0.087
3	0.0146	0.0177	2	0.047	0.063
4	0.0032	0.0054	3	0.063	0.068
5	0.0275	0.0235	4	0.095	0.116
6	0.0235	0.0301	5	0.074	0.084
7	0.0230	0.0288	6	0.118	0.131
8	0.0000	0.0	7	0.107	0.118
9	0.0019	0.0041	8	0.111	0.129
10	0.0000	0.0	9	<b>0.132</b>	<b>0.149</b>
11	0.0065	0.0063			
12	0.0060	0.0057			
13	0.0166	0.0180			

Figure H.1. Montague un-thinned pitch pine canopy bulk density. Chart shows the maximum running mean of the highest density plot is 0.132 kg/m<sup>3</sup>.

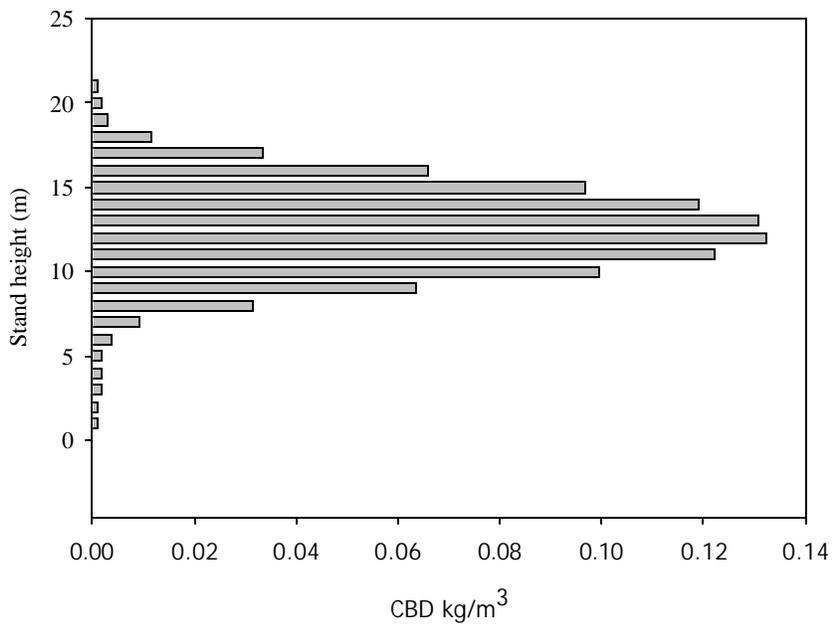
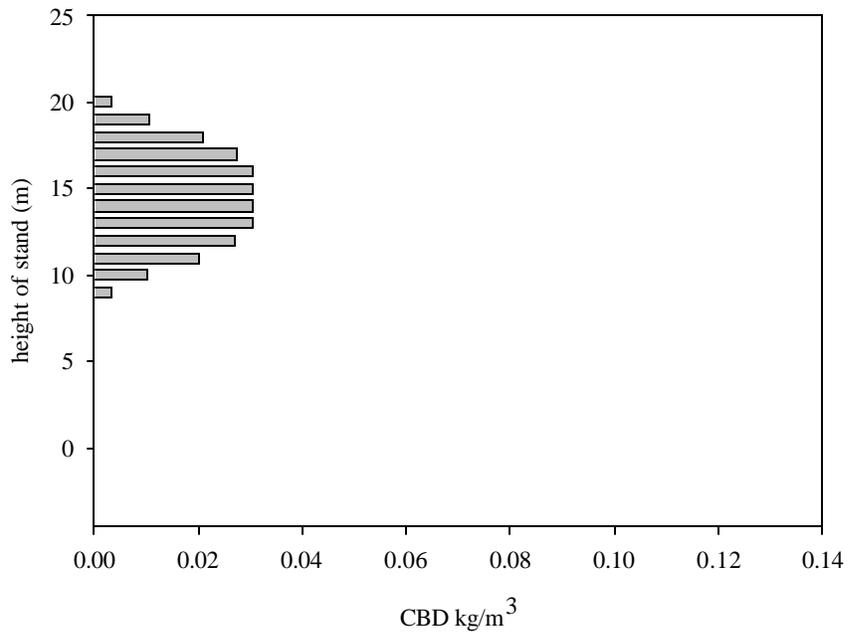


Figure H. 2. Montague thinned pitch pine canopy bulk density. Chart shows the maximum running mean of the highest density plot is 0.030 kg/m<sup>3</sup>.



TR	PL	DB	CB	HT	CC	CD	PITCH EQUATION				WHITE BARK PINE EQUATION			
							FW	BW	AF	AFM	FW	BW	AF	AFM
co	m101	11.8	6.6	12i		6	1114.9	957.5	1593.7	266	3838.6	1990.5	4833.9	805.6
co	m101	19.9	8.1	14.6c		7	7065.3	4565.6	9348.1	1335	9052.5	3850.9	10977.9	1568.3
co	m101	14.8	3.5	6.8s		4	2944.0	1265.6	3576.8	894	5406.3	2632.0	6722.3	1680.6
co	m101	16.3	6	12.5c		7	4868.1	3156.0	6446.1	921	5406.3	2632.0	6722.3	960.3
co	m101	19.3	5.6	11.9c		7	6672.8	4314.2	8829.9	1261	9052.5	3850.9	10977.9	1568.3
co	m101	16.3	4	9.5i		6	2037.7	1740.9	2908.1	485	5406.3	2632.0	6722.3	1120.4
co	m101	25.8	0	12.2c		12	11471.5	7381.7	15162.4	1264	13215.0	4843.2	15636.6	1303.1
co	m101	12	5.1	9.5i		5	1150.5	987.8	1644.3	329	3838.6	1990.5	4833.9	966.8
co	m101	22	5.6	13.2c		8	8520.3	5496.9	11268.8	1409	11080.6	4383.8	13272.5	1659.1
co	m101	20.4	5.2	10.6c		6	7400.2	4780.1	9790.3	1632	9052.5	3850.9	10977.9	1829.7
co	m101	23.5	5.2	12.8c		8	9636.7	6210.4	12741.9	1593	11080.6	4383.8	13272.5	1659.1
co	m101	21.6	7.6	12.8c		6	8233.5	5313.4	10890.2	1815	11080.6	4383.8	13272.5	2212.1
co	m101	16.9	0	11.2c		11	5207.9	3374.3	6895.1	627	7153.1	3260.3	8783.2	798.5
co	m101	11.5	10.6	12.9i		3	1062.6	913.0	1519.1	506	3838.6	1990.5	4833.9	1611.3
co	m101	28.7	5.5	12.4d		7	13995.1	8990.0	18490.1	2641	15435.5	5216.6	18043.8	2577.7
co	m101	17	6.3	12.2c		6	5265.6	3411.4	6971.2	1162	7153.1	3260.3	8783.2	1463.9
co	m101	20	5.2	12.6c		8	7131.7	4608.2	9435.8	1179	9052.5	3850.9	10977.9	1372.2
co	m101	5.3	2	4s		2	433.0	189.3	527.6	264	506.1	312.6	662.4	331.2
co	m101	1.1	1.5	2s		1	23.0	10.3	28.2	28	0.0	0.0	0.0	0.0
co	m101	24.8	5.8	12.4d		7	10655.5	6861.0	14086.1	2012	13215.0	4843.2	15636.6	2233.8
co	m101	6.5	2.5	4.5s		3	633.7	276.1	771.8	257	1356.4	792.1	1752.4	584.1
co	m101	27	5.3	12.8c		8	12487.5	8029.5	16502.3	2063	15435.5	5216.6	18043.8	2255.5
co	m101	13.3	0	10.4c		10	3330.2	2166.1	4413.2	441	3838.6	1990.5	4833.9	483.4
co	m101	22.1	0.5	11.6c		12	8592.8	5543.2	11364.4	947	11080.6	4383.8	13272.5	1106.0
co	m101	8.5	0.2	6.3i		6	604.4	521.8	865.3	144	1356.4	792.1	1752.4	292.1
co	m101	5.7	0.7	5i		5	286.7	249.1	411.2	82	506.1	312.6	662.4	132.5
co	m101	8.2	6.3	10i		4	565.2	488.3	809.3	202	1356.4	792.1	1752.4	438.1
co	m101	6	2.3	4.2s		2	545.8	238.1	664.8	332	506.1	312.6	662.4	331.2
co	m101	12.1	4	7.8i		4	1168.4	1003.1	1669.9	417	3838.6	1990.5	4833.9	1208.5
co	m101	21	4	9.9c		6	7811.7	5043.5	10333.5	1722	9052.5	3850.9	10977.9	1829.7
co	m101	17.1	5.6	10.5c		6	5323.5	3448.6	7047.8	1175	7153.1	3260.3	8783.2	1463.9
co	m101	9.9	5.4	7.4i		2	803.4	691.9	1149.4	575	2478.3	1365.4	3161.0	1580.5
co	m101	23.1	5.4	12.8c		8	9332.7	6016.2	12340.9	1543	11080.6	4383.8	13272.5	1659.1
co	m101	8.4	5.7	9.8i		5	591.2	510.5	846.5	169	1356.4	792.1	1752.4	350.5
co	m101	9.3	8.8	11.4c		3	1707.9	1117.4	2266.6	756	2478.3	1365.4	3161.0	1053.7
co	m101	21.3	5.6	12.3d		7	8021.3	5177.7	10610.1	1516	9052.5	3850.9	10977.9	1568.3
co	m101	21.9	2.1	11.3c		9	8448.2	5450.8	11173.6	1242	11080.6	4383.8	13272.5	1474.7
co	m101	21.8	6.4	11.8c		6	8376.3	5404.8	11078.7	1846	11080.6	4383.8	13272.5	2212.1
co	m101	14.8	6.9	10.7c		5	4065.3	2639.7	5385.2	1077	5406.3	2632.0	6722.3	1344.5
co	m101	21	3.2	11.5c		9	7811.7	5043.5	10333.5	1148	9052.5	3850.9	10977.9	1219.8
co	m101	15.5	5.4	11.7c		7	4431.6	2875.4	5869.3	838	5406.3	2632.0	6722.3	960.3
co	m101	21.8	4.4	12.4c		8	8376.3	5404.8	11078.7	1385	11080.6	4383.8	13272.5	1659.1
co	m101	26.9	3.9	11.5d		9	12401.3	7974.6	16388.6	1821	15435.5	5216.6	18043.8	2004.9
co	m101	4.9	0	3.9s		4	374.0	163.7	455.8	114	506.1	312.6	662.4	165.6
co	m101	13.8	7	11.9c		5	3567.7	2319.2	4727.3	945	3838.6	1990.5	4833.9	966.8
co	m101	5	0.3	5.2s		5	388.3	169.9	473.3	95	506.1	312.6	662.4	132.5
co	m45	22.5	12	19.8c		8	8885.4	5730.3	11750.5	1469	11080.6	4383.8	13272.5	1659.1
co	m45	24.7	11	19.4c		8	10575.5	6809.9	13980.4	1748	13215.0	4843.2	15636.6	1954.6
co	m45	41.4	10.8	21.6c		12	27732.5	17708.5	36586.8	3049	27229.5	5554.8	30006.9	2500.6
co	m45	5	1	5s		4	388.3	169.9	473.3	118	506.1	312.6	662.4	165.6
co	m45	30.9	11.4	19.6c		9	16063.9	10306.5	21217.1	2357	17723.4	5494.7	20470.7	2274.5
co	m45	33.3	14	22c		8	18470.9	11836.4	24389.2	3049	20061.6	5670.9	22897.0	2862.1
co	m45	25.1	15.8	20.2c		5	10897.4	7015.4	14405.1	2881	13215.0	4843.2	15636.6	3127.3
co	m45	23.2	12	18.2c		6	9408.3	6064.5	12440.6	2073	11080.6	4383.8	13272.5	2212.1
co	m45	32.2	12.4	20.2c		8	17348.3	11123.1	22909.9	2864	20061.6	5670.9	22897.0	2862.1
co	m45	16.4	12	13.8i		2	2061.1	1760.7	2941.4	1471	5406.3	2632.0	6722.3	3361.2

co	m45	17.8	12.8	16.2	s	4	4154.9	1780.8	5045.3	1261	7153.1	3260.3	8783.2	2195.8
co	m45	29	14.8	20.6	c	7	14269.4	9164.6	18851.7	2693	15435.5	5216.6	18043.8	2577.7
co	m45	41.4	15	24.2	c	9	27732.5	17708.5	36586.8	4065	27229.5	5554.8	30006.9	3334.1
co	m45	20.2	11.8	16.8	i	6	3041.2	2589.1	4335.7	723	9052.5	3850.9	10977.9	1829.7
co	m45	31.4	13.4	21.8	c	9	16552.5	10617.2	21861.1	2429	17723.4	5494.7	20470.7	2274.5
co	m45	36.2	13.6	21.2	c	8	21586.4	13814.1	28493.5	3562	22434.5	5740.9	25305.0	3163.1
co	m45	24.7	12.8	20	c	8	10575.5	6809.9	13980.4	1748	13215.0	4843.2	15636.6	1954.6
co	m45	16.7	10.2	15.6	i	6	2132.0	1820.7	3042.4	507	7153.1	3260.3	8783.2	1463.9
co	m120	24	12.8	18.4	c	6	10022.9	6457.1	13251.5	2209	11080.6	4383.8	13272.5	2212.1
co	m120	25.7	14	19.8	c	6	11388.7	7328.9	15053.1	2509	13215.0	4843.2	15636.6	2606.1
co	m120	28.2	12	19.2	c	7	13543.4	8702.3	17894.6	2556	15435.5	5216.6	18043.8	2577.7
co	m120	23.2	14.4	21	c	7	9408.3	6064.5	12440.6	1777	11080.6	4383.8	13272.5	1896.1
co	m120	20.7	15.6	22.8	i	8	3183.2	2708.9	4537.7	567	9052.5	3850.9	10977.9	1372.2
co	m120	31.4	14.2	22.2	c	8	16552.5	10617.2	21861.1	2733	17723.4	5494.7	20470.7	2558.8
co	m120	23.3	15.2	19.4	i	4	3969.9	3371.9	5655.9	1414	11080.6	4383.8	13272.5	3318.1
co	m120	32.4	15.2	25	c	10	17550.0	11251.3	23175.7	2318	20061.6	5670.9	22897.0	2289.7
co	m120	31.1	17.4	22.4	c	5	16258.5	10430.3	21473.6	4295	17723.4	5494.7	20470.7	4094.1
co	m120	30.8	17.4	24	c	7	15967.0	10244.9	21089.4	3013	17723.4	5494.7	20470.7	2924.4
co	m120	61.3	11.2	25.6	d	15	57699.7	36609.5	76004.4	5067	45541.9	12950.4	52017.1	3467.8
co	m120	36.2	16.2	22	c	6	21586.4	13814.1	28493.5	4749	22434.5	5740.9	25305.0	4217.5
co	m120	25.8	16	21.6	i	6	4801.8	4071.8	6837.7	1140	13215.0	4843.2	15636.6	2606.1
co	m120	22.3	3.2	21.4	i	18	3657.8	3109.0	5212.3	290	11080.6	4383.8	13272.5	737.4
co	m120	23.5	9.8	19.8	c	11	9636.7	6210.4	12741.9	1158	11080.6	4383.8	13272.5	1206.6
co	m120	30.2	18	25.8	c	8	15391.3	9878.6	20330.6	2541	17723.4	5494.7	20470.7	2558.8
co	m120	37.1	12	18	c	6	22599.0	14456.3	29827.1	4971	24828.1	5702.3	27679.3	4613.2
co	m120	28.3	14.4	23.2	c	9	13633.2	8759.5	18012.9	2001	15435.5	5216.6	18043.8	2004.9
co	m120	28	13.4	22.2	c	9	13364.7	8588.5	17658.9	1962	15435.5	5216.6	18043.8	2004.9
co	1	15.3	9.5	13.7	i	5	1810.6	1548.4	2584.8	517	5406.3	2632.0	6722.3	1344.5
co	1	17.9	10.8	13.1	s	3	4198.6	1799.3	5098.2	1699	7153.1	3260.3	8783.2	2927.7
co	1	6.5	4	5	s	1	633.7	276.1	771.8	772	1356.4	792.1	1752.4	1752.4
co	1	12.5	12	16.2	i	4	1241.5	1065.3	1774.2	444	3838.6	1990.5	4833.9	1208.5
co	1	15.7	11.1	14.1	i	3	1899.9	1624.1	2712.0	904	5406.3	2632.0	6722.3	2240.8
co	1	8	7	9.8	s	3	933.7	405.4	1136.5	379	1356.4	792.1	1752.4	584.1
co	1	11.5	11.2	12.8	i	2	1062.6	913.0	1519.1	760	3838.6	1990.5	4833.9	2416.9
co	1	12.3	11.2	12.8	i	2	1204.7	1033.9	1721.7	861	3838.6	1990.5	4833.9	2416.9
co	1	6.9	2	6	s	4	708.5	308.4	862.6	216	1356.4	792.1	1752.4	438.1
co	1	20.2	9.45	13.95	c	5	7265.4	4693.8	9612.3	1922	9052.5	3850.9	10977.9	2195.6
co	1	11.6	9.8	13.1	i	4	1079.9	927.7	1543.8	386	3838.6	1990.5	4833.9	1208.5
co	1	13.6	9.2	13.2	c	4	3471.8	2257.4	4600.5	1150	3838.6	1990.5	4833.9	1208.5
co	1	6.9	5.2	6.8	s	2	708.5	308.4	862.6	431	1356.4	792.1	1752.4	876.2
co	1	6.8	3	7.2	s	4	689.4	300.1	839.5	210	1356.4	792.1	1752.4	438.1
co	1	6	5.2	6.8	s	2	545.8	238.1	664.8	332	506.1	312.6	662.4	331.2
co	1	19.2	9	15.15	c	6	6608.5	4272.9	8744.9	1457	9052.5	3850.9	10977.9	1829.7
co	1	3.2	1.5	2.1	s	1	168.8	74.4	206.0	206	0.0	0.0	0.0	0.0
co	1	14.6	11	14.4	c	3	3963.4	2574.1	5250.5	1750	5406.3	2632.0	6722.3	2240.8
co	1	3	1.5	2	s	1	149.7	66.0	182.7	183	0.0	0.0	0.0	0.0
co	1	3.8	2	4.2	s	2	232.7	102.3	283.8	142	0.0	0.0	0.0	0.0
co	1	12.9	8.3	13.9	i	6	1316.7	1129.2	1881.3	314	3838.6	1990.5	4833.9	805.6
co	1	30.9	6.45	14.85	d	9	16063.9	10306.5	21217.1	2357	17723.4	5494.7	20470.7	2274.5
co	1	12.8	10.5	15.9	c	6	3100.3	2017.9	4109.2	685	3838.6	1990.5	4833.9	805.6
co	1	4.8	1.1	3.5	s	3	359.8	157.6	438.6	146	506.1	312.6	662.4	220.8
co	1	10.9	4.4	6.2	s	2	1663.3	718.6	2022.6	1011	2478.3	1365.4	3161.0	1580.5
co	1	7.3	4	5	s	1	787.0	342.3	958.2	958	1356.4	792.1	1752.4	1752.4
co	1	2.5	0.5	3	s	3	106.5	47.1	130.0	43	0.0	0.0	0.0	0.0
co	1	2.1	0.4	2.2	s	2	76.9	34.1	94.0	47	0.0	0.0	0.0	0.0
co	1	9.2	4.1	6.6	s	3	1212.1	525.1	1474.6	492	2478.3	1365.4	3161.0	1053.7
co	1	36.2	4.5	16.95	d	13	21586.4	13814.1	28493.5	2192	22434.5	5740.9	25305.0	1946.5
co	1	3.8	1.5	4	s	3	232.7	102.3	283.8	95	0.0	0.0	0.0	0.0
co	1	13.8	1.3	5.8	s	5	2583.6	1111.9	3139.5	628	3838.6	1990.5	4833.9	966.8

co	1	3.4	1.1	1.8s	1	189.0	83.2	230.7	231	0.0	0.0	0.0	0.0
co	1	5.5	3.5	4.2s	1	464.0	202.7	565.3	565	506.1	312.6	662.4	662.4
co	1	10.2	6.3	11.2i	5	849.4	731.2	1215.0	243	2478.3	1365.4	3161.0	632.2
co	1	7.3	5.3	7.6s	3	787.0	342.3	958.2	319	1356.4	792.1	1752.4	584.1
co	1	24	2.7	13.35c	11	10022.9	6457.1	13251.5	1205	11080.6	4383.8	13272.5	1206.6
co	1	7.8	5	6.7s	2	890.6	386.9	1084.1	542	1356.4	792.1	1752.4	876.2
co	1	14.9	5.25	12.3c	7	4116.8	2672.8	5453.2	779	5406.3	2632.0	6722.3	960.3
co	1	4.1	4	5.5s	2	268.1	117.7	327.0	164	506.1	312.6	662.4	331.2
co	1	4.7	2.8	4.5s	3	346.0	151.5	421.7	141	506.1	312.6	662.4	220.8
co	1	2.9	1.1	1.6s	1	140.5	62.0	171.5	172	0.0	0.0	0.0	0.0
co	1	21	5.25	14.25c	9	7811.7	5043.5	10333.5	1148	9052.5	3850.9	10977.9	1219.8
co	1	38.5	5.1	17.1d	12	24216.8	15481.9	31957.7	2663	24828.1	5702.3	27679.3	2306.6
co	1	31	5.4	17.25c	12	16161.0	10368.3	21345.2	1779	17723.4	5494.7	20470.7	1705.9
co	1	4.9	4	4.5s	1	374.0	163.7	455.8	456	506.1	312.6	662.4	662.4
co	1	7.5	4	6s	2	827.8	359.8	1007.7	504	1356.4	792.1	1752.4	876.2
co	1	5.5	4	4.5s	1	464.0	202.7	565.3	565	506.1	312.6	662.4	662.4
co	1	6.5	3	4s	1	633.7	276.1	771.8	772	1356.4	792.1	1752.4	1752.4
co	1	18.5	8.1	14.55c	7	6165.8	3989.1	8160.4	1166	7153.1	3260.3	8783.2	1254.7
co	1	14.7	5.7	9i	4	1680.3	1437.9	2399.3	600	5406.3	2632.0	6722.3	1680.6
co	1	10.88	4.2	9c	5	2289.1	1493.8	3036.0	607	2478.3	1365.4	3161.0	632.2
co	1	6.2	5.8	7.3i	2	335.4	291.1	480.9	240	506.1	312.6	662.4	331.2
co	1	8.4	4.4	9.4i	5	591.2	510.5	846.5	169	1356.4	792.1	1752.4	350.5
co	1	4.8	4.5	7s	3	359.8	157.6	438.6	146	506.1	312.6	662.4	220.8
co	1	8.3	4.3	8.6i	5	578.1	499.4	827.8	166	1356.4	792.1	1752.4	350.5
co	1	10.2	7	9.9s	3	1469.5	635.6	1787.3	596	2478.3	1365.4	3161.0	1053.7
co	1	6	5.4	6.3s	1	545.8	238.1	664.8	665	506.1	312.6	662.4	662.4
co	1	21	7.2	15.15c	8	7811.7	5043.5	10333.5	1292	9052.5	3850.9	10977.9	1372.2
co	1	14	8.25	15.45c	7	3664.8	2381.8	4855.7	694	5406.3	2632.0	6722.3	960.3
co	1	16.1	8.1	14.7c	7	4757.2	3084.7	6299.5	900	5406.3	2632.0	6722.3	960.3
co	1	8.9	6.9	12.45i	6	658.6	568.2	942.7	157	2478.3	1365.4	3161.0	526.8
co	2	20.9	5.4	13.05c	8	7742.4	4999.2	10242.0	1280	9052.5	3850.9	10977.9	1372.2
co	2	3.3	0	3s	3	178.8	78.8	218.2	73	0.0	0.0	0.0	0.0
co	2	25.5	4.35	11.55d	8	11223.8	7223.7	14835.6	1854	13215.0	4843.2	15636.6	1954.6
co	2	12.1	5.7	10.05i	5	1168.4	1003.1	1669.9	334	3838.6	1990.5	4833.9	966.8
co	2	10.4	4.9	9.1i	5	880.8	758.0	1259.8	252	2478.3	1365.4	3161.0	632.2
co	2	12.6	2.9	8.1c	6	3010.5	1959.9	3990.5	665	3838.6	1990.5	4833.9	805.6
co	2	5	1.8	3.5s	3	388.3	169.9	473.3	158	506.1	312.6	662.4	220.8
co	2	22	3.75	10.5d	8	8520.3	5496.9	11268.8	1409	11080.6	4383.8	13272.5	1659.1
co	2	15	2.25	8.4c	6	4168.5	2706.1	5521.6	920	5406.3	2632.0	6722.3	1120.4
co	2	0.6	0	2s	2	7.4	3.4	9.1	5	0.0	0.0	0.0	0.0
co	2	2	0	2.1s	2	70.2	31.2	85.8	43	0.0	0.0	0.0	0.0
co	2	7.8	1.4	6.3i	5	514.8	445.1	737.4	147	1356.4	792.1	1752.4	350.5
co	2	19.3	1.5	10.35c	9	6672.8	4314.2	8829.9	981	9052.5	3850.9	10977.9	1219.8
co	2	25.5	4.95	12.45d	8	11223.8	7223.7	14835.6	1854	13215.0	4843.2	15636.6	1954.6
co	2	9.4	2.3	7.9i	6	729.3	628.7	1043.6	174	2478.3	1365.4	3161.0	526.8
co	2	25.8	4.65	14.25d	10	11471.5	7381.7	15162.4	1516	13215.0	4843.2	15636.6	1563.7
co	2	31	6.9	13.65d	8	16161.0	10368.3	21345.2	2668	17723.4	5494.7	20470.7	2558.8
co	2	27.9	6.6	13.35i	7	5557.0	4706.1	7910.1	1130	15435.5	5216.6	18043.8	2577.7
co	2	14.6	2.7	12.45i	10	1659.0	1419.9	2369.0	237	5406.3	2632.0	6722.3	672.2
co	2	5	0.2	2.6s	3	388.3	169.9	473.3	158	506.1	312.6	662.4	220.8
co	2	10.9	4.4	7.1s	3	1663.3	718.6	2022.6	674	2478.3	1365.4	3161.0	1053.7
co	2	5	1.7	3.5s	3	388.3	169.9	473.3	158	506.1	312.6	662.4	220.8
co	2	6.6	1.7	3.8s	3	652.0	284.0	794.1	265	1356.4	792.1	1752.4	584.1
co	2	20	7.95	14.55c	8	7131.7	4608.2	9435.8	1179	9052.5	3850.9	10977.9	1372.2
co	2	24.8	6.75	15.15c	9	10655.5	6861.0	14086.1	1565	13215.0	4843.2	15636.6	1737.4
co	2	21.5	6.9	7.8i	2	3416.7	2905.8	4869.6	2435	9052.5	3850.9	10977.9	5489.0
co	3	7.1	2.4	2.9s	1	747.3	325.1	909.8	910	1356.4	792.1	1752.4	1752.4
co	3	5.9	2.5	4.3s	2	528.9	230.8	644.3	322	506.1	312.6	662.4	331.2
co	3	1.3	0.5	1.8s	2	31.4	14.1	38.4	19	0.0	0.0	0.0	0.0

co	3	2.1	1.1	2.3s	1	76.9	34.1	94.0	94	0.0	0.0	0.0	0.0
co	3	25.1	9.3	16.65c	8	10897.4	7015.4	14405.1	1801	13215.0	4843.2	15636.6	1954.6
co	3	13.6	11.4	15i	4	1453.2	1245.2	2075.8	519	3838.6	1990.5	4833.9	1208.5
co	3	4.3	2.8	6.1s	4	293.1	128.5	357.3	89	506.1	312.6	662.4	165.6
co	3	26	10.2	17.4c	7	11638.1	7487.9	15382.1	2197	13215.0	4843.2	15636.6	2233.8
co	3	3.1	0.4	2.5s	3	159.1	70.2	194.2	65	0.0	0.0	0.0	0.0
co	3	2.2	1.3	2.8s	2	83.9	37.2	102.5	51	0.0	0.0	0.0	0.0
co	3	1.5	0.8	1.9s	2	41.0	18.3	50.2	25	0.0	0.0	0.0	0.0
co	3	4.7	3	5s	2	346.0	151.5	421.7	211	506.1	312.6	662.4	331.2
co	3	25.5	7.65	14.85c	8	11223.8	7223.7	14835.6	1854	13215.0	4843.2	15636.6	1954.6
co	3	14.6	3.6	15.3i	12	1659.0	1419.9	2369.0	197	5406.3	2632.0	6722.3	560.2
co	3	12.4	11.85	15.3i	4	1223.1	1049.6	1747.9	437	3838.6	1990.5	4833.9	1208.5
co	3	5.3	2.1	5s	3	433.0	189.3	527.6	176	506.1	312.6	662.4	220.8
co	3	7.7	1.8	6s	5	869.4	377.8	1058.3	212	1356.4	792.1	1752.4	350.5
co	3	25.6	6.45	8.7c	3	11306.1	7276.2	14944.2	4981	13215.0	4843.2	15636.6	5212.2
co	3	19.6	11.25	17.25c	6	6867.8	4439.1	9087.3	1515	9052.5	3850.9	10977.9	1829.7
co	3	17.6	4.65	15.6c	12	5617.8	3637.5	7436.5	620	7153.1	3260.3	8783.2	731.9
co	3	2.7	0.4	2.2s	2	122.9	54.3	150.1	75	0.0	0.0	0.0	0.0
co	3	32.7	9	18.3c	9	17854.6	11444.8	23577.0	2620	20061.6	5670.9	22897.0	2544.1
co	3	4.2	4.2	7.1s	3	280.5	123.1	342.0	114	506.1	312.6	662.4	220.8
co	3	5.4	1	8.1s	7	448.3	195.9	546.3	78	506.1	312.6	662.4	94.6
co	3	4.3	1	7.2s	6	293.1	128.5	357.3	60	506.1	312.6	662.4	110.4
co	3	16.8	9	15c	6	5150.5	3337.5	6819.3	1137	7153.1	3260.3	8783.2	1463.9
co	3	28.3	5.25	12.9c	8	13633.2	8759.5	18012.9	2252	15435.5	5216.6	18043.8	2255.5
co	3	26.8	6.3	18c	12	12315.4	7919.8	16275.3	1356	15435.5	5216.6	18043.8	1503.6
co	3	2.4	1	5s	4	98.7	43.7	120.5	30	0.0	0.0	0.0	0.0
co	3	3	0.2	5s	5	149.7	66.0	182.7	37	0.0	0.0	0.0	0.0
co	3	33	6.75	17.55c	12	18161.5	11639.9	23981.5	1998	20061.6	5670.9	22897.0	1908.1
co	3	25.8	7.5	18.3c	11	11471.5	7381.7	15162.4	1378	13215.0	4843.2	15636.6	1421.5
co	3	6.5	1.4	4.7s	4	633.7	276.1	771.8	193	1356.4	792.1	1752.4	438.1
co	3	7.3	3.8	7.9i	5	454.9	393.8	651.8	130	1356.4	792.1	1752.4	350.5
co	3	27.7	7	12.4c	5	13098.6	8419.0	17308.1	3462	15435.5	5216.6	18043.8	3608.8
co	3	32.5	6.8	20c	14	17651.3	11315.7	23309.1	1665	20061.6	5670.9	22897.0	1635.5
co	3	35.8	8.4	19.6c	12	21143.3	13533.0	27909.8	2326	22434.5	5740.9	25305.0	2108.7
co	4	2.4	0	0.6s	1	98.7	43.7	120.5	121	0.0	0.0	0.0	0.0
co	4	14.5	11.55	16.5i	6	1637.9	1401.9	2338.9	390	5406.3	2632.0	6722.3	1120.4
co	4	18	10.2	15.6c	6	5858.4	3791.9	7754.4	1292	7153.1	3260.3	8783.2	1463.9
co	4	27.2	9.45	15.75c	7	12660.7	8139.9	16730.7	2390	15435.5	5216.6	18043.8	2577.7
co	4	12.7	7.8	12i	5	1278.9	1097.0	1827.4	365	3838.6	1990.5	4833.9	966.8
co	4	16.5	8.1	14.1c	6	4980.2	3228.0	6594.2	1099	5406.3	2632.0	6722.3	1120.4
co	4	22.6	9.3	15.45c	6	8959.2	5777.5	11848.0	1975	11080.6	4383.8	13272.5	2212.1
co	4	5.8	2	4s	2	512.3	223.6	624.1	312	506.1	312.6	662.4	331.2
co	4	11.3	8.25	17.4i	9	1028.4	883.8	1470.3	163	2478.3	1365.4	3161.0	351.2
co	4	29.8	9.3	17.85c	9	15012.9	9637.9	19831.9	2204	17723.4	5494.7	20470.7	2274.5
co	4	16.1	3.8	5.8s	3	3445.0	1478.9	4184.4	1395	5406.3	2632.0	6722.3	2240.8
co	4	8.8	8.55	10.35s	2	1115.6	483.6	1357.4	679	1356.4	792.1	1752.4	876.2
co	4	13.9	10.05	15.75i	6	1513.6	1296.5	2161.9	360	3838.6	1990.5	4833.9	805.6
co	4	14.4	7.5	14.7i	8	1616.9	1384.1	2308.9	289	5406.3	2632.0	6722.3	840.3
co	4	24.7	10.05	16.65c	7	10575.5	6809.9	13980.4	1997	13215.0	4843.2	15636.6	2233.8
co	4	1.6	0.3	2.1s	2	46.3	20.6	56.6	28	0.0	0.0	0.0	0.0
co	4	23.4	9	15.3c	6	9560.3	6161.6	12641.1	2107	11080.6	4383.8	13272.5	2212.1
co	4	18.7	9.15	15.45c	6	6290.8	4069.3	8325.5	1388	7153.1	3260.3	8783.2	1463.9
co	4	24.3	9.3	15.45c	6	10258.0	6607.3	13561.7	2260	13215.0	4843.2	15636.6	2606.1
co	4	21	9.9	16.8c	8	7811.7	5043.5	10333.5	1292	9052.5	3850.9	10977.9	1372.2
co	4	24.8	9.45	15.6c	7	10655.5	6861.0	14086.1	2012	13215.0	4843.2	15636.6	2233.8
co	4	16.8	8.4	13.2i	5	2155.9	1841.0	3076.4	615	7153.1	3260.3	8783.2	1756.6
co	4	16.5	9.3	12.6c	4	4980.2	3228.0	6594.2	1649	5406.3	2632.0	6722.3	1680.6
co	4	18.7	9.6	15.15c	6	6290.8	4069.3	8325.5	1388	7153.1	3260.3	8783.2	1463.9
co	4	11.1	8.7	12.6i	5	994.7	855.1	1422.2	284	2478.3	1365.4	3161.0	632.2

co	4	2.7	1.3	3.2s	2	122.9	54.3	150.1	75	0.0	0.0	0.0	0.0
co	4	17.9	8.4	13.95c	6	5797.8	3753.0	7674.3	1279	7153.1	3260.3	8783.2	1463.9
co	4	4.5	1	4s	3	319.0	139.8	388.9	130	506.1	312.6	662.4	220.8
co	4	26.6	8.7	15c	7	12144.4	7810.8	16049.8	2293	13215.0	4843.2	15636.6	2233.8
co	4	24.7	10.05	15.6c	6	10575.5	6809.9	13980.4	2330	13215.0	4843.2	15636.6	2606.1
co	4	3.7	1	3s	2	221.4	97.3	270.0	135	0.0	0.0	0.0	0.0
co	4	1.1	0.1	2.4s	2	23.0	10.3	28.2	14	0.0	0.0	0.0	0.0
co	4	7	2	7.2s	5	727.7	316.7	886.1	177	1356.4	792.1	1752.4	350.5
co	4	15.2	9.9	14.55c	6	4272.8	2773.3	5659.5	943	5406.3	2632.0	6722.3	1120.4
co	4	5.1	1	6.5s	6	403.0	176.3	491.1	82	506.1	312.6	662.4	110.4
co	4	3.2	2	6.5s	5	168.8	74.4	206.0	41	0.0	0.0	0.0	0.0
co	4	14.8	10.8	15.45c	5	4065.3	2639.7	5385.2	1077	5406.3	2632.0	6722.3	1344.5
co	4	27.8	10.95	16.8c	7	13187.0	8475.3	17424.7	2489	15435.5	5216.6	18043.8	2577.7
co	4	13.2	10.5	13.95i	4	1374.5	1178.3	1963.6	491	3838.6	1990.5	4833.9	1208.5
co	4	15	10.95	14.1i	4	1744.9	1492.7	2491.2	623	5406.3	2632.0	6722.3	1680.6
co	4	22.9	10.65	16.5c	7	9182.5	5920.2	12142.6	1735	11080.6	4383.8	13272.5	1896.1
co	5	7.5	1.5	3.6s	3	827.8	359.8	1007.7	336	1356.4	792.1	1752.4	584.1
co	5	19.5	10.05	13.5c	4	6802.5	4397.3	9001.1	2250	9052.5	3850.9	10977.9	2744.5
co	5	16.5	9.75	13.35c	4	4980.2	3228.0	6594.2	1649	5406.3	2632.0	6722.3	1680.6
co	5	3.2	0.5	1.8s	2	168.8	74.4	206.0	103	0.0	0.0	0.0	0.0
co	5	5	1	2s	1	388.3	169.9	473.3	473	506.1	312.6	662.4	662.4
co	5	33.5	7.5	17.85c	11	18678.5	11968.3	24662.7	2242	20061.6	5670.9	22897.0	2081.5
co	5	33.8	9.9	19.35c	10	18992.0	12167.4	25075.7	2508	20061.6	5670.9	22897.0	2289.7
co	5	2.8	1	3s	2	131.6	58.1	160.6	80	0.0	0.0	0.0	0.0
co	5	2.6	1	2.8s	2	114.6	50.7	139.9	70	0.0	0.0	0.0	0.0
co	5	16.7	6.9	12.6i	7	2132.0	1820.7	3042.4	435	7153.1	3260.3	8783.2	1254.7
co	5	20	5.1	11.7i	7	2985.2	2541.9	4256.2	608	9052.5	3850.9	10977.9	1568.3
co	5	2	0.7	3.5s	4	70.2	31.2	85.8	21	0.0	0.0	0.0	0.0
co	5	1.2	1	1.7s	1	27.1	12.1	33.1	33	0.0	0.0	0.0	0.0
co	5	30.1	6.75	15.3c	9	15296.3	9818.2	20205.4	2245	17723.4	5494.7	20470.7	2274.5
co	5	11.9	2.5	5.2s	3	1959.5	845.3	2382.1	794	3838.6	1990.5	4833.9	1611.3
co	5	20.4	4.5	12.45c	8	7400.2	4780.1	9790.3	1224	9052.5	3850.9	10977.9	1372.2
co	5	1.8	1	3s	2	57.7	25.7	70.5	35	0.0	0.0	0.0	0.0
co	5	3.1	0.5	4s	4	159.1	70.2	194.2	49	0.0	0.0	0.0	0.0
co	5	12.2	8.7	11.25i	3	1186.5	1018.4	1695.7	565	3838.6	1990.5	4833.9	1611.3
co	5	12.9	6.75	11.1i	5	1316.7	1129.2	1881.3	376	3838.6	1990.5	4833.9	966.8
co	5	13.3	6.75	11.25i	5	1394.0	1194.8	1991.4	398	3838.6	1990.5	4833.9	966.8
co	5	47.7	5.25	19.95d	15	36126.0	23015.1	47633.6	3176	34369.3	4473.1	36605.8	2440.4
co	5	2.2	0.7	3s	3	83.9	37.2	102.5	34	0.0	0.0	0.0	0.0
co	5	2.2	0.7	3s	3	83.9	37.2	102.5	34	0.0	0.0	0.0	0.0
co	5	1.6	0	2.8s	3	46.3	20.6	56.6	19	0.0	0.0	0.0	0.0
co	5	23.9	8.1	15.9c	8	9945.1	6407.4	13148.8	1644	11080.6	4383.8	13272.5	1659.1
co	5	23	6.6	13.35c	7	9257.5	5968.1	12241.5	1749	11080.6	4383.8	13272.5	1896.1
co	5	10.5	4.95	9s	5	1551.2	670.6	1886.5	377	2478.3	1365.4	3161.0	632.2
co	5	33	10.5	19.05d	9	18161.5	11639.9	23981.5	2665	20061.6	5670.9	22897.0	2544.1
co	5	18.2	9.9	17.55i	9	2503.4	2134.8	3570.8	397	7153.1	3260.3	8783.2	975.9
co	5	31.3	9	19.35d	10	16454.2	10554.7	21731.6	2173	17723.4	5494.7	20470.7	2047.1
co	5	1	0.2	1.8s	2	19.3	8.6	23.6	12	0.0	0.0	0.0	0.0
co	5	5.5	1.5	4.5s	4	464.0	202.7	565.3	141	506.1	312.6	662.4	165.6
co	5	13	2.1	10.5s	9	2311.0	995.6	2808.8	312	3838.6	1990.5	4833.9	537.1
co	5	22.5	6.15	13.35c	7	8885.4	5730.3	11750.5	1679	11080.6	4383.8	13272.5	1896.1
co	5	11.5	1.5	3.6s	3	1838.3	793.5	2235.1	745	3838.6	1990.5	4833.9	1611.3
co	5	18.5	9	16.05c	7	6165.8	3989.1	8160.4	1166	7153.1	3260.3	8783.2	1254.7
co	5	9.8	9.45	11.85i	3	788.3	679.1	1127.8	376	2478.3	1365.4	3161.0	1053.7
co	5	27.9	8.48	17.6c	10	13275.7	8531.8	17541.6	1754	15435.5	5216.6	18043.8	1804.4
co	5	7	1.7	2.5s	2	727.7	316.7	886.1	443	1356.4	792.1	1752.4	876.2
co	6	10	10.92	15.68i	6	818.6	704.9	1171.1	195	2478.3	1365.4	3161.0	632.2
co	6	16.5	12.46	18.2c	6	4980.2	3228.0	6594.2	1099	5406.3	2632.0	6722.3	1120.4
co	6	2	1.4	2.5s	2	70.2	31.2	85.8	43	0.0	0.0	0.0	0.0

co	6	12.7	10.27	14.82i	5	1278.9	1097.0	1827.4	365	3838.6	1990.5	4833.9	966.8
co	6	2.3	3	4.2s	1	91.1	40.4	111.3	111	0.0	0.0	0.0	0.0
co	6	20.6	9.84	15c	6	7536.2	4867.2	9969.8	1662	9052.5	3850.9	10977.9	2195.6
co	6	11.4	5.9	9.3s	4	1808.6	780.8	2199.0	550	2478.3	1365.4	3161.0	1053.7
co	6	22	12.48	18.46i	6	3566.5	3032.1	5082.6	847	11080.6	4383.8	13272.5	2212.1
co	6	30.7	10.65	19.5d	10	15870.3	10183.4	20962.0	2096	17723.4	5494.7	20470.7	2274.5
co	6	15.2	9.9	15.9i	7	1788.6	1529.7	2553.4	365	5406.3	2632.0	6722.3	1120.4
co	6	30.8	10.2	21.45d	11	15967.0	10244.9	21089.4	1917	17723.4	5494.7	20470.7	1861.0
co	6	11.2	8.64	11.88i	4	1011.4	869.4	1446.1	362	2478.3	1365.4	3161.0	1053.7
co	6	11.6	1.1	11.55s	11	1868.3	806.3	2271.4	206	3838.6	1990.5	4833.9	439.4
co	6	40.1	14.2	20.2d	6	26129.2	16693.4	34475.8	5746	27229.5	5554.8	30006.9	5001.1
co	6	22.9	12.45	18.3c	6	9182.5	5920.2	12142.6	2024	11080.6	4383.8	13272.5	2212.1
co	6	18.8	10.8	15.5c	6	6353.8	4109.6	8408.6	1401	7153.1	3260.3	8783.2	1756.6
co	6	21.5	11.4	15.6c	5	8162.4	5268.0	10796.4	2159	9052.5	3850.9	10977.9	2195.6
co	6	1.2	0.7	2s	2	27.1	12.1	33.1	17	0.0	0.0	0.0	0.0
co	6	17.8	12.6	16.65c	5	5737.5	3714.3	7594.7	1519	7153.1	3260.3	8783.2	2195.8
co	6	22.9	11.7	17.55c	7	9182.5	5920.2	12142.6	1735	11080.6	4383.8	13272.5	2212.1
co	6	26.1	12.24	20.04d	8	11721.8	7541.3	15492.4	1937	13215.0	4843.2	15636.6	1954.6
co	6	15.2	3.3	1.65i	-1	1788.6	1529.7	2553.4	-2553	5406.3	2632.0	6722.3	-6722.3
co	6	36.6	6.86	13.02d	7	22033.8	14097.9	29082.7	4155	22434.5	5740.9	25305.0	4217.5
co	6	26.2	4.08	17.64d	14	11805.7	7594.9	15603.2	1115	13215.0	4843.2	15636.6	1116.9
co	6	2.4	0	3.9s	4	98.7	43.7	120.5	30	0.0	0.0	0.0	0.0
co	6	36.3	8.96	20.02d	12	21697.9	13884.8	28640.3	2387	22434.5	5740.9	25305.0	2300.5
co	6	11.7	9.75	15.6i	7	1097.4	942.6	1568.6	224	3838.6	1990.5	4833.9	805.6
co	6	8.3	9.49	12.74s	4	1000.2	434.0	1217.2	304	1356.4	792.1	1752.4	438.1
co	6	25.2	11.2	19.6d	9	10978.6	7067.2	14512.2	1612	13215.0	4843.2	15636.6	1737.4
co	6	30.5	8.4	19.18d	11	15677.9	10061.0	20708.4	1883	17723.4	5494.7	20470.7	1861.0
co	6	23.1	9.94	15.26c	6	9332.7	6016.2	12340.9	2057	11080.6	4383.8	13272.5	2654.5
co	6	13.9	8.16	14.52i	7	1513.6	1296.5	2161.9	309	3838.6	1990.5	4833.9	690.6
co	6	16.8	10.08	17.08c	7	5150.5	3337.5	6819.3	974	7153.1	3260.3	8783.2	1254.7
co	6	8.2	3.38	4.55s	2	977.8	424.4	1190.0	595	1356.4	792.1	1752.4	876.2
co	6	21.3	11.05	16.9c	6	8021.3	5177.7	10610.1	1768	9052.5	3850.9	10977.9	1829.7
co	6	32.6	9.8	19.32d	10	17752.8	11380.2	23442.9	2344	20061.6	5670.9	22897.0	2544.1
co	6	2.6	1.8	3.2s	2	114.6	50.7	139.9	70	0.0	0.0	0.0	0.0
co	6	9.2	6.8	9.7s	4	1212.1	525.1	1474.6	369	2478.3	1365.4	3161.0	1053.7
co	6	26.9	10.2	18d	8	12401.3	7974.6	16388.6	2049	15435.5	5216.6	18043.8	2255.5
co	6	5.3	1	4.2s	3	433.0	189.3	527.6	176	506.1	312.6	662.4	220.8
co	6	5.6	5.39	6.6s	2	479.8	209.6	584.6	292	506.1	312.6	662.4	331.2
co	6	7.9	6.16	11.34s	5	912.1	396.1	1110.1	222	1356.4	792.1	1752.4	350.5
co	6	21.2	11.7	16.12c	5	7951.1	5132.8	10517.5	2104	9052.5	3850.9	10977.9	2744.5
co	6	9	2.5	7.32s	5	1163.3	504.2	1415.4	283	2478.3	1365.4	3161.0	790.3
co	6	25.5	9.8	18.9d	10	11223.8	7223.7	14835.6	1484	13215.0	4843.2	15636.6	1737.4
co	6	15.4	5.61	12.54i	8	1832.7	1567.2	2616.3	327	5406.3	2632.0	6722.3	960.3
co	6	24.8	8.82	17.08d	9	10655.5	6861.0	14086.1	1565	13215.0	4843.2	15636.6	1954.6
co	6	7.4	3.5	7.7s	5	807.3	351.0	982.8	197	1356.4	792.1	1752.4	438.1
co	7	26.3	8.1	16.4d	8	11890.0	7648.6	15714.3	1964	13215.0	4843.2	15636.6	1954.6
co	7	21.6	8.9	16.4c	8	8233.5	5313.4	10890.2	1361	11080.6	4383.8	13272.5	1896.1
co	7	11.5	9.9	12.3i	3	1062.6	913.0	1519.1	506	3838.6	1990.5	4833.9	2416.9
co	7	22.3	9.8	18.6c	10	8738.5	5636.4	11556.7	1156	11080.6	4383.8	13272.5	1474.7
co	7	13.2	12.3	15.4i	3	1374.5	1178.3	1963.6	655	3838.6	1990.5	4833.9	1611.3
co	7	19.9	8	15c	7	7065.3	4565.6	9348.1	1335	9052.5	3850.9	10977.9	1568.3
co	7	21.7	10.9	15.5c	6	8304.7	5359.0	10984.3	1831	11080.6	4383.8	13272.5	2654.5
co	7	20	13.1	16.8c	4	7131.7	4608.2	9435.8	2359	9052.5	3850.9	10977.9	2744.5
co	7	22.5	8.8	17.2c	9	8885.4	5730.3	11750.5	1306	11080.6	4383.8	13272.5	1659.1
co	7	21.6	9.9	17.6c	9	8233.5	5313.4	10890.2	1210	11080.6	4383.8	13272.5	1659.1
co	7	27	10.1	17.8d	8	12487.5	8029.5	16502.3	2063	15435.5	5216.6	18043.8	2255.5
co	7	12.7	10.3	16i	6	1278.9	1097.0	1827.4	305	3838.6	1990.5	4833.9	805.6
co	7	42.6	0	18.4d	18	29251.8	18670.0	38586.8	2144	29627.0	5299.1	32276.5	1793.1
co	7	27.8	10.5	20.3c	10	13187.0	8475.3	17424.7	1742	15435.5	5216.6	18043.8	2004.9

co	7	18.9	6.6	17.8i	12	2686.1	2289.2	3830.7	319	7153.1	3260.3	8783.2	798.5
co	7	23.2	9.5	18.9c	10	9408.3	6064.5	12440.6	1244	11080.6	4383.8	13272.5	1474.7
co	7	3	1	2.9s	2	149.7	66.0	182.7	91	0.0	0.0	0.0	0.0
co	7	27.6	7.2	19.4c	12	13010.5	8362.8	17191.9	1433	15435.5	5216.6	18043.8	1503.6
co	7	18	12.6	15.6c	4	5858.4	3791.9	7754.4	1939	7153.1	3260.3	8783.2	2927.7
co	7	13.8	8.1	13.2i	5	1493.4	1279.3	2133.0	427	3838.6	1990.5	4833.9	966.8
co	7	6.5	2	6.8s	5	633.7	276.1	771.8	154	1356.4	792.1	1752.4	350.5
co	7	6.3	2.3	5.2s	3	597.8	260.6	728.1	243	506.1	312.6	662.4	220.8
co	7	1	0.8	2.2s	2	19.3	8.6	23.6	12	0.0	0.0	0.0	0.0
co	7	1.8	1.5	2.8s	2	57.7	25.7	70.5	35	0.0	0.0	0.0	0.0
co	7	3.8	1	4.5s	4	232.7	102.3	283.8	71	0.0	0.0	0.0	0.0
co	7	5.5	3	5s	2	464.0	202.7	565.3	283	506.1	312.6	662.4	331.2
co	7	32.9	9	17.1d	8	18058.9	11574.7	23846.3	2981	20061.6	5670.9	22897.0	2862.1
co	7	1.8	0.5	2.5s	3	57.7	25.7	70.5	24	0.0	0.0	0.0	0.0
co	7	5	1.7	4.5s	4	388.3	169.9	473.3	118	506.1	312.6	662.4	220.8
co	7	3.4	1.2	3.1s	2	189.0	83.2	230.7	115	0.0	0.0	0.0	0.0
co	7	24.7	9.4	18.8c	10	10575.5	6809.9	13980.4	1398	13215.0	4843.2	15636.6	1563.7
co	7	0.8	0.5	1.6s	2	12.7	5.7	15.6	8	0.0	0.0	0.0	0.0
co	7	3.2	1.2	4s	3	168.8	74.4	206.0	69	0.0	0.0	0.0	0.0
co	7	3	1.2	3.8s	3	149.7	66.0	182.7	61	0.0	0.0	0.0	0.0
co	7	31.9	6.9	19.4d	13	17047.9	10932.1	22513.9	1732	20061.6	5670.9	22897.0	1908.1
co	7	9.4	1.4	7.4s	6	1261.7	546.4	1534.9	256	2478.3	1365.4	3161.0	526.8
co	7	27.8	9.9	19.2d	10	13187.0	8475.3	17424.7	1742	15435.5	5216.6	18043.8	2004.9
co	7	13.8	8.1	14i	6	1493.4	1279.3	2133.0	356	3838.6	1990.5	4833.9	805.6
co	7	10.2	9.4	11.2i	2	849.4	731.2	1215.0	608	2478.3	1365.4	3161.0	1580.5
co	7	9	4.6	8.7s	5	1163.3	504.2	1415.4	283	2478.3	1365.4	3161.0	790.3
co	7	7.5	7.5	12.4s	5	827.8	359.8	1007.7	202	1356.4	792.1	1752.4	438.1
co	7	36.5	9.5	18.3d	9	21921.5	14026.7	28934.9	3215	22434.5	5740.9	25305.0	3163.1
co	7	21.3	6.2	8.8i	3	3357.6	2856.0	4785.6	1595	9052.5	3850.9	10977.9	3659.3
co	7	3	0.7	4.3s	4	149.7	66.0	182.7	46	0.0	0.0	0.0	0.0
co	7	6.4	0.3	3s	3	615.6	268.3	749.8	250	1356.4	792.1	1752.4	584.1
co	7	4.8	0.2	4.5s	5	359.8	157.6	438.6	88	506.1	312.6	662.4	132.5
co	7	5.1	3.19	4.84s	2	403.0	176.3	491.1	246	506.1	312.6	662.4	331.2
co	7	11.8	0	12.48i	12	1114.9	957.5	1593.7	133	3838.6	1990.5	4833.9	402.8
co	7	34.7	11.31	22.23d	11	19946.8	12773.7	26333.6	2394	22434.5	5740.9	25305.0	2300.5
co	7	11	3.6	5.5i	3	978.0	840.9	1398.4	466	2478.3	1365.4	3161.0	1580.5
co	7	17.9	9.8	14.7c	6	5797.8	3753.0	7674.3	1279	7153.1	3260.3	8783.2	1756.6
co	7	10.5	4.34	12.46i	8	896.6	771.5	1282.4	160	2478.3	1365.4	3161.0	395.1
co	7	18.8	8.68	17.08c	9	6353.8	4109.6	8408.6	934	7153.1	3260.3	8783.2	1097.9
co	7	19.9	8.68	17.08c	9	7065.3	4565.6	9348.1	1039	9052.5	3850.9	10977.9	1372.2
co	8	13.8	12.88	18.2i	6	1493.4	1279.3	2133.0	356	3838.6	1990.5	4833.9	966.8
co	8	18.6	12.6	16.66i	5	2607.0	2222.5	3718.3	744	7153.1	3260.3	8783.2	2195.8
co	8	22.9	13.58	19.88c	7	9182.5	5920.2	12142.6	1735	11080.6	4383.8	13272.5	2212.1
co	8	14	1.2	18.48i	17	1534.0	1313.8	2190.9	129	5406.3	2632.0	6722.3	395.4
co	8	9.9	1.26	14.14i	13	803.4	691.9	1149.4	88	2478.3	1365.4	3161.0	243.2
co	8	18.9	12.74	16.66c	5	6417.0	4150.2	8492.1	1698	7153.1	3260.3	8783.2	2195.8
co	8	13.1	9.01	13.6i	5	1355.1	1161.8	1936.0	387	3838.6	1990.5	4833.9	966.8
co	8	19.2	13.43	21.59d	9	6608.5	4272.9	8744.9	972	9052.5	3850.9	10977.9	1219.8
co	8	14.5	12.75	17.85c	6	3912.9	2541.6	5183.7	864	5406.3	2632.0	6722.3	1344.5
co	8	11.1	13.77	16.32s	3	1720.8	743.2	2092.4	697	2478.3	1365.4	3161.0	1580.5
co	8	21.1	13.12	18.24c	5	7881.3	5088.1	10425.3	2085	9052.5	3850.9	10977.9	2195.6
co	8	22	10.78	18.9c	9	8520.3	5496.9	11268.8	1252	11080.6	4383.8	13272.5	1659.1
co	8	29	10.35	17.25d	7	14269.4	9164.6	18851.7	2693	15435.5	5216.6	18043.8	2577.7
co	8	27.1	13.2	20.85d	8	12574.0	8084.6	16616.3	2077	15435.5	5216.6	18043.8	2255.5
co	8	25.2	9.9	18.9c	10	10978.6	7067.2	14512.2	1451	13215.0	4843.2	15636.6	1737.4
co	8	13.5	6.56	13.92i	8	1433.4	1228.3	2047.5	256	3838.6	1990.5	4833.9	690.6
co	8	26.1	10.5	20.7c	11	11721.8	7541.3	15492.4	1408	13215.0	4843.2	15636.6	1563.7
co	8	7.9	4.32	7.32s	3	912.1	396.1	1110.1	370	1356.4	792.1	1752.4	584.1
co	8	10.9	7.8	10.27s	3	1663.3	718.6	2022.6	674	2478.3	1365.4	3161.0	1580.5

co	8	28.5	7	18.34	d	11	13813.6	8874.4	18250.8	1659	15435.5	5216.6	18043.8	1640.3
co	8	16.5	6.44	10.22	i	4	2084.6	1780.6	2974.9	744	5406.3	2632.0	6722.3	1680.6
co	8	29.8	10.54	18.36	d	8	15012.9	9637.9	19831.9	2479	17723.4	5494.7	20470.7	2924.4
co	8	3	1	4	s	3	149.7	66.0	182.7	61	0.0	0.0	0.0	0.0
co	8	1.5	1	1.6	s	1	41.0	18.3	50.2	50	0.0	0.0	0.0	0.0
co	8	8	0	5	s	5	933.7	405.4	1136.5	227	1356.4	792.1	1752.4	350.5
co	8	21.8	6.84	17.64	d	12	8376.3	5404.8	11078.7	923	11080.6	4383.8	13272.5	1206.6
co	8	19.9	8.36	16.34	c	8	7065.3	4565.6	9348.1	1169	9052.5	3850.9	10977.9	1372.2
co	8	19.8	11.02	17.1	c	6	6999.1	4523.3	9260.8	1543	9052.5	3850.9	10977.9	1829.7
co	8	21.9	6.15	15.9	d	10	8448.2	5450.8	11173.6	1117	11080.6	4383.8	13272.5	1327.2
co	8	2	0.7	2.4	s	2	70.2	31.2	85.8	43	0.0	0.0	0.0	0.0
co	8	2.4	1.5	3.5	s	3	98.7	43.7	120.5	40	0.0	0.0	0.0	0.0
co	8	3.5	1.2	3.8	s	3	199.6	87.8	243.5	81	0.0	0.0	0.0	0.0
co	8	3.7	1.3	4.5	s	4	221.4	97.3	270.0	68	0.0	0.0	0.0	0.0
co	8	7.6	0.016	1	i	1	490.4	424.2	702.6	703	1356.4	792.1	1752.4	1752.4
co	8	3	0	3	s	3	149.7	66.0	182.7	61	0.0	0.0	0.0	0.0
co	8	10.3	1.5	7.1	i	6	865.0	744.6	1237.3	206	2478.3	1365.4	3161.0	632.2
co	8	5.1	0.5	2	s	2	403.0	176.3	491.1	246	506.1	312.6	662.4	662.4
co	8	5.3	1.2	4.4	s	3	433.0	189.3	527.6	176	506.1	312.6	662.4	220.8
co	8	16.2	3	14.17	i	11	2014.4	1721.1	2875.0	261	5406.3	2632.0	6722.3	611.1
co	8	13.6	1	12.48	i	11	1453.2	1245.2	2075.8	189	3838.6	1990.5	4833.9	439.4
co	8	22.9	3.38	15.47	c	12	9182.5	5920.2	12142.6	1012	11080.6	4383.8	13272.5	1106.0
co	8	20.9	3.38	15.47	c	12	7742.4	4999.2	10242.0	853	9052.5	3850.9	10977.9	914.8
co	8	21.9	8	15.68	c	8	8448.2	5450.8	11173.6	1397	11080.6	4383.8	13272.5	1659.1
co	8	18.9	8.82	15.68	c	8	6417.0	4150.2	8492.1	1062	7153.1	3260.3	8783.2	1254.7
co	8	23.8	7.67	16.64	c	10	9867.6	6357.9	13046.5	1305	11080.6	4383.8	13272.5	1474.7
co	8	20.8	7.93	17.29	c	10	7673.4	4955.0	10150.9	1015	9052.5	3850.9	10977.9	1219.8
co	8	7.2	5.32	7.56	s	3	767.0	333.6	933.8	311	1356.4	792.1	1752.4	584.1
co	8	24.2	10.64	17.5	d	8	10179.4	6557.1	13457.9	1682	13215.0	4843.2	15636.6	2233.8
co	8	20.4	12.15	16.8	c	5	7400.2	4780.1	9790.3	1958	9052.5	3850.9	10977.9	2195.6
co	8	23.5	12.24	19.04	d	7	9636.7	6210.4	12741.9	1820	11080.6	4383.8	13272.5	1896.1
co	8	20.8	12.92	20.4	c	8	7673.4	4955.0	10150.9	1269	9052.5	3850.9	10977.9	1568.3
co	8	18.1	12.75	18.02	c	6	5919.3	3831.0	7834.8	1306	7153.1	3260.3	8783.2	1756.6
co	8	20.5	8.16	17.92	c	10	7468.1	4823.6	9879.9	988	9052.5	3850.9	10977.9	1097.8
co	8	14.6	10.01	14.17	i	4	1659.0	1419.9	2369.0	592	5406.3	2632.0	6722.3	1680.6
co	9	2.2	0.4	2.4	s	2	83.9	37.2	102.5	51	0.0	0.0	0.0	0.0
co	9	16.6	7.98	12.74	i	6	2108.3	1800.6	3008.6	501	7153.1	3260.3	8783.2	1756.6
co	9	25.4	7.14	15.26	c	8	11141.8	7171.3	14727.5	1841	13215.0	4843.2	15636.6	1954.6
co	9	32.8	8.26	17.22	d	9	17956.6	11509.7	23711.5	2635	20061.6	5670.9	22897.0	2544.1
co	9	25.9	8.82	15.54	c	8	11554.7	7434.7	15272.0	1909	13215.0	4843.2	15636.6	2233.8
co	9	20.7	9.54	14.4	c	5	7604.7	4911.0	10060.2	2012	9052.5	3850.9	10977.9	2744.5
co	9	20.5	8.32	13.28	c	5	7468.1	4823.6	9879.9	1976	9052.5	3850.9	10977.9	2195.6
co	9	24.2	9.38	14.7	d	6	10179.4	6557.1	13457.9	2243	13215.0	4843.2	15636.6	2606.1
co	9	29.4	8.32	15.21	d	7	14639.0	9399.9	19338.9	2763	17723.4	5494.7	20470.7	2924.4
co	9	18.9	8.64	14.88	c	7	6417.0	4150.2	8492.1	1213	7153.1	3260.3	8783.2	1463.9
co	9	6.4	1.5	7	s	6	615.6	268.3	749.8	125	1356.4	792.1	1752.4	350.5
co	9	2	2	3.4	s	1	70.2	31.2	85.8	86	0.0	0.0	0.0	0.0
co	9	3.3	0	4	s	4	178.8	78.8	218.2	55	0.0	0.0	0.0	0.0
co	9	40.7	8.1	17.1	d	9	26863.7	17158.5	35442.9	3938	27229.5	5554.8	30006.9	3334.1
co	9	0.9	0	1.5	s	2	15.8	7.1	19.4	10	0.0	0.0	0.0	0.0
co	9	17.6	1.3	11.96	i	11	2351.5	2006.4	3354.7	305	7153.1	3260.3	8783.2	798.5
co	9	1	0	2	s	2	19.3	8.6	23.6	12	0.0	0.0	0.0	0.0
co	9	5	2.8	4.3	s	2	388.3	169.9	473.3	237	506.1	312.6	662.4	662.4
co	9	4.2	2	4.8	s	3	280.5	123.1	342.0	114	506.1	312.6	662.4	220.8
co	9	1.1	0.5	2.5	s	3	23.0	10.3	28.2	9	0.0	0.0	0.0	0.0
co	9	23.8	8.96	14.84	c	7	9867.6	6357.9	13046.5	1864	11080.6	4383.8	13272.5	2212.1
co	9	22.3	6.86	14.28	c	8	8738.5	5636.4	11556.7	1445	11080.6	4383.8	13272.5	1896.1
co	9	22	7.5	15	c	8	8520.3	5496.9	11268.8	1409	11080.6	4383.8	13272.5	1896.1
co	9	16.1	8.7	13.2	i	5	1991.3	1701.5	2842.1	568	5406.3	2632.0	6722.3	1680.6

co	9	33.6	6.3	15.75	d	10	18782.8	12034.5	24800.0	2480	20061.6	5670.9	22897.0	2289.7
co	9	1.3	0	2.2	s	2	31.4	14.1	38.4	19	0.0	0.0	0.0	0.0
co	9	28.5	9.69	15.64	d	7	13813.6	8874.4	18250.8	2607	15435.5	5216.6	18043.8	3007.3
co	9	18.5	10.08	15.52	c	6	6165.8	3989.1	8160.4	1360	7153.1	3260.3	8783.2	1463.9
co	9	22.1	8.16	15.52	c	8	8592.8	5543.2	11364.4	1421	11080.6	4383.8	13272.5	1659.1
co	9	31.2	8.48	15.68	d	8	16356.2	10492.4	21602.4	2700	17723.4	5494.7	20470.7	2558.8
co	9	31.5	8.32	15.68	d	8	16651.0	10679.9	21990.9	2749	17723.4	5494.7	20470.7	2558.8
co	9	20.3	8.8	12.64	c	5	7332.7	4736.9	9701.1	1940	9052.5	3850.9	10977.9	2744.5
co	9	16.7	9.49	15.6	i	7	2132.0	1820.7	3042.4	435	7153.1	3260.3	8783.2	1254.7
co	9	22.5	9.49	16.64	c	8	8885.4	5730.3	11750.5	1469	11080.6	4383.8	13272.5	1659.1
co	9	1.8	0.3	1.8	s	2	57.7	25.7	70.5	35	0.0	0.0	0.0	0.0
co	9	22	10.66	14.3	c	4	8520.3	5496.9	11268.8	2817	11080.6	4383.8	13272.5	4424.2
co	9	22.7	9.88	19.63	c	11	9033.4	5824.9	11945.8	1086	11080.6	4383.8	13272.5	1327.2
co	9	9	5.72	8.71	s	4	1163.3	504.2	1415.4	354	2478.3	1365.4	3161.0	1053.7
co	9	0.7	0	1.5	s	2	9.9	4.5	12.1	6	0.0	0.0	0.0	0.0
co	9	28.6	8.96	17.12	d	9	13904.2	8932.1	18370.2	2041	15435.5	5216.6	18043.8	2255.5
co	9	17.5	10.88	14.88	i	5	2326.6	1985.4	3319.3	664	7153.1	3260.3	8783.2	2195.8
co	9	16.3	7.04	13.12	i	6	2037.7	1740.9	2908.1	485	5406.3	2632.0	6722.3	1120.4
th	p12	23.8	12	16.4	i	4	4130.4	3507.0	5884.0	1471	11080.6	4383.8	13272.5	3318.1
th	p5	42.5	7.6	17.4	c	10	29123.8	18589.0	38418.2	3842	29627.0	5299.1	32276.5	3227.7
th	p5	35	8.4	19	d	11	20269.9	12978.7	26759.3	2433	22434.5	5740.9	25305.0	2300.5
th	1	48.5	9.2	19.4	d	10	37265.2	23734.4	49132.4	4913	34369.3	4473.1	36605.8	3660.6
th	1	30	13.8	19	i	6	6363.2	5382.5	9054.4	1509	17723.4	5494.7	20470.7	3411.8
th	2	41.1	9.6	17.8	c	9	27358.6	17471.8	36094.5	4010	27229.5	5554.8	30006.9	3334.1
th	2	32.5	10.2	17.4	c	7	17651.3	11315.7	23309.1	3330	20061.6	5670.9	22897.0	3271.0
th	2	32	11.6	18.8	d	8	17147.7	10995.6	22645.6	2831	20061.6	5670.9	22897.0	2862.1
th	2	27.5	10.8	17.6	i	8	5409.3	4582.1	7700.3	963	15435.5	5216.6	18043.8	2255.5
th	2	30	11.8	19.2	i	8	6363.2	5382.5	9054.4	1132	17723.4	5494.7	20470.7	2558.8
th	3	32.4	8.6	18.2	c	10	17550.0	11251.3	23175.7	2318	20061.6	5670.9	22897.0	2289.7
th	3	27.4	10.6	16.6	i	7	5372.6	4551.3	7648.2	1093	15435.5	5216.6	18043.8	2577.7
th	3	37.3	8.4	19.8	d	12	22826.9	14600.8	30127.3	2511	24828.1	5702.3	27679.3	2306.6
th	4	20.3	10	15.2	s	5	5310.0	2271.0	6445.6	1289	9052.5	3850.9	10977.9	2195.6
th	5	34.2	12.6	19.2	c	7	19413.7	12435.2	25631.3	3662	20061.6	5670.9	22897.0	3271.0
th	5	40.5	8.8	17.6	d	10	26617.8	17002.8	35119.2	3512	27229.5	5554.8	30006.9	3000.7
th	5	43.2	12.8	21.6	d	10	30025.5	19159.5	39605.3	3961	29627.0	5299.1	32276.5	3227.7
th	6	18.3	6.5	7.2	s	1	4375.4	1874.4	5312.6	5313	7153.1	3260.3	8783.2	8783.2
th	6	44.8	10.8	22.2	d	12	32134.6	20493.1	42381.1	3532	32010.1	4937.5	34478.8	2873.2
th	6	30.6	12	15	i	3	6602.8	5583.4	9394.5	3131	17723.4	5494.7	20470.7	6823.6
th	6	40	9.4	20.6	c	12	26007.7	16616.4	34315.9	2860	27229.5	5554.8	30006.9	2500.6
th	7	21.7	12.8	17.6	s	6	6014.0	2569.3	7298.6	1216	11080.6	4383.8	13272.5	2212.1
th	7	19.1	9.8	16.6	i	8	2739.4	2334.3	3906.5	488	9052.5	3850.9	10977.9	1372.2
th	7	26.8	9	12.6	s	4	8918.4	3797.0	10816.9	2704	15435.5	5216.6	18043.8	4510.9
th	7	32.8	9	17.8	c	9	17956.6	11509.7	23711.5	2635	20061.6	5670.9	22897.0	2544.1
th	7	41.7	9.4	21.2	d	12	28108.8	17946.7	37082.2	3090	27229.5	5554.8	30006.9	2500.6
th	8	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt
th	9	24.1	11.6	18.6	i	8	4228.2	3589.3	6022.8	753	11080.6	4383.8	13272.5	1659.1
th	10	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt	nt
th	11	32.9	8	17.4	c	9	18058.9	11574.7	23846.3	2650	20061.6	5670.9	22897.0	2544.1
th	12	33.1	7.8	16.6	d	10	18264.4	11705.2	24117.0	2412	20061.6	5670.9	22897.0	2289.7
th	13	34.9	12	22.8	c	11	20162.0	12910.2	26617.1	2420	22434.5	5740.9	25305.0	2300.5
th	13	35.8	13	21.4	c	8	21143.3	13533.0	27909.8	3489	22434.5	5740.9	25305.0	3163.1
th	13	28.2	13	23	i	10	5669.1	4800.2	8069.2	807	15435.5	5216.6	18043.8	1804.4

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